THE UNIVERSITY
OF ILLINOIS
LIBRARY
622.06
AME
v.24
REMOTE STORAGE
ENGINEERING ALTGELD HALL ANNEX

REMOTE STORAGE

Report of the Proceedings

622.06
AME
V.24

OF THE

Twenty-fourth Annual Convention

OF THE

American Mining Congress

CHICAGO, ILLINOIS

OCTOBER 17-22, 1921

UNIVERSITY OF ILLINOIS LIBRARY
MAR 27

National Conference Coal Operators

National Tax Conference

National Oil Shale Conference

National Gold Conference

Underground Loading Conference

National Educational Conference

National Standardization Conference

National Exposition of Mines, Mining Machinery and Equipment

Published by THE AMERICAN MINING CONGRESS, Munsey Bldg., Washington, D. C.

PREVIOUS SESSIONS OF CONGRESS

	DATE		CITY	PRESIDENT	ADDRESS
1st	July,	1897*	Denver, Colo.	Hon. Alva Adams,	Pueblo, Colo.
1st	July,	1897	Denver, Colo.	Hon. L. Bradford Prince,	Santa Fe, N. M.
2d	July,	1898	Salt Lake City, Utah	Hon. L. Bradford Prince,	Santa Fe, N. M.
3d	July,	1899†	Milwaukee, Wis.	Col. B. F. Montgomery,	Cripple Creek, Colo.
3d	June,	1900	Milwaukee, Wis.	Col. B. F. Montgomery,	Cripple Creek, Colo.
4th	July,	1901	Boise, Idaho	Hon. L. Bradford Prince,	Santa Fe, N. M.
5th	Sept.,	1902	Butte, Mont.	E. L. Shafner,	Cleveland, Ohio
6th	Sept.,	1903	Deadwood and Lead, S. D.	Hon. J. H. Richards,	Boise, Idaho
7th	Aug.,	1904	Portland, Ore.	Hon. J. H. Richards,	Boise, Idaho
8th	Nov.,	1905	El Paso, Texas	Hon. J. H. Richards,	Boise, Idaho
9th	Oct.,	1906	Denver, Colo.	Hon. J. H. Richards,	Boise, Idaho
10th	Nov.,	1907	Joplin, Mo.	Hon. J. H. Richards,	Boise, Idaho
11th	Dec.,	1908	Pittsburgh, Pa.	Hon. J. H. Richards,	Boise, Idaho
12th	Oct.,	1909	Goldfield, Nev.	Hon. J. H. Richards,	Boise, Idaho
13th	Oct.,	1910	Los Angeles, Cal.	Dr. E. R. Buckley,	Rolla, Mo.
14th	Oct.,	1911	Chicago, Ill.	John Dern,	Salt Lake City, Utah
15th	Nov.,	1912	Spokane, Wash.	Samuel A. Taylor,	Pittsburgh, Pa.
16th	Oct.,	1913	Philadelphia, Pa.	David W. Brunton,	Denver, Colo.
17th	Dec.,	1914	Phoenix, Ariz.	Carl Scholz,	Chicago, Ill.
18th	Sept.,	1915	San Francisco, Cal.	Carl Scholz,	Chicago, Ill.
19th	Nov.,	1916	Chicago, Ill.	Carl Scholz,	Chicago, Ill.
	Dec.,	1917	Members Meeting, N.Y.	Walter Douglas,	Pres., N. Y.
	Dec.,	1918	Members Meeting, N.Y.	Walter Douglas,	Pres., N. Y.
		1917-18		No Convention, account war	
17th	Nov.,	1919	St. Louis, Mo.	Bulkeley Wells,	Denver, Colo.
15th	Nov.,	1920	Denver, Colo.	Bulkeley Wells,	Denver, Colo.
17th	Oct.,	1921	Chicago, Ill.	Wm. J. Loring,	San Francisco, Cal.

* Temporary.
† Passed to June, 1900.

622.06 Mining
AME Engineering
v.24

Proceedings of
The American Mining Congress
Twenty-Fourth Annual Session
CHICAGO, ILL.

Preliminary Conferences

The following preliminary conferences were held on Monday, October 18th: Meeting of Board of Directors of American Mining Congress, 9 A. M. Committee on Standardization under direction of Col. Warren G. Roberts, Chairman, began its conference at 10 A. M. A second meeting was held at 2:30 P. M. The Committee on Taxation, Paul J. Armitage, Chairman, began its meeting at the same hour. The general Convention and Exposition Committees met in joint session at 4:30 P. M.

The Exposition

The Exposition of Mines and Mining Equipment, which entirely filled the Coliseum, was formally opened Monday, October 17th, at 8 P. M.

OPENING SESSION OF THE CONVENTION

TUESDAY, OCTOBER 18, 1921

The opening session of the Twenty-Fourth Annual Convention of the American Mining Congress convened in the Convention Hall at the Coliseum at 10:30 a. m., Mr. H. C. Adams, State Vice-President of the American Mining Congress for Illinois, presiding as temporary Chairman.

MR. H. C. ADAMS: Ladies and Gentlemen of the American Mining Congress:

As Vice-President of the American Mining Congress of the State of Illinois, I have the honor of calling the Congress to order. A varied program has been prepared out of which I think there will come some excellent results. The mining industry has many serious problems to confront. The public is clamoring for lower prices, lower freight rates, and lower wage scales, and some useful

501773

suggestions may be given us to help solve the problems. Our outputs are not up to standard either in quality or quantity, our market conditions are generally unsatisfactory—there is a constant demand for return to "normalcy" (whatever that means) but if it is a condition that prevailed prior to 1916 it is our hope that we may never return to it. What our industry needs is a fair day's work for a fair day's pay and a fair return on our capital invested.

I want to call your special attention to the wonderful exhibition of mining machinery and devices which is the greatest that has ever been collected. I also wish to call your attention to the moving pictures which tell the story of coal, zinc, silver, lead and other minerals, and time spent in this Exposition will repay you well.

While you have a large amount of work to do there has been a program prepared for your pleasure, and on Wednesday evening a Smoker will be held in this building and I am not at liberty to tell you what the program is, but I can say to you that if you are not present you will miss something good, and there will be a lot on the program besides "smoke." On Friday evening a banquet will be given in the Gold room of the Congress Hotel, and speakers of national reputation will discuss matters which will interest you. The coal industry of Chicago welcomes you and hopes you will have not only a pleasant but a profitable stay. I now take pleasure in introducing to you your permanent Chairman, Mr. Loring of California.

CHAIRMAN LORING: Ladies and Gentlemen: It affords me great pleasure to meet you here today. I had hoped that we would see more seats filled but I think they are gradually coming in and we hope to have a good meeting before the proceedings are over.

I am going to read what I have to say so that it will probably sound a little better than if I spoke extemporaneously.

Another year has passed, all too soon, perhaps because we have been so occupied with serious problems that we have paid little heed to the passage of time. The receipts for the year just ended show the substantial figure of $150,000, which, compared with the year before, again indicates the hearty support of our members and subscribers. This is the best indication of approval

of our endeavors during the last period, and it has been a strenuous one, indeed.

The efficiency of the organization has been well maintained and is available at all times, and for all purposes, for its members at its headquarters in Washington.

The Mining Congress Journal has grown in importance and I think it is a useful journal and one of which the American Mining Congress members should be proud. It does not trespass upon the rights of the other publications and is altogether a creditable journal. It has earned some profit, which is a fine achievement for a newly born journal of this kind. The usual bulletin service continues and gives much satisfaction to members of the Congress, as the details contained in these bulletins are of vital importance to the mining industry.

The American Mining Congress is a useful organization to the various branches of the mining industry and is being looked upon more and more each year as the mouthpiece of the mining industry. This is what it exists for and I hope that each year will see the membership increase as it has done in the past, as that will prove that it is growing in importance.

The Congress has passed through a most trying year. Your directors and able secretary have been ever mindful of the great task before them and have given good council during these most trying months when everyone and everything pertaining to our affairs have been at high pressure; when the slightest mistake would have been considered ample opportunity to find fault. Under these conditions, great strides have been made. Note the wonderful exposition in the next room. Do you suppose that show came into existence without great effort? I should say not. Could it have been accomplished during these days of cautious expenditure of money if there had not been confidence in the American Mining Congress? I say, no.

We have continued our campaign for the passage of the McFadden Bill. While we have not been successful in getting the support we had anticipated when the campaign was commenced, we have not given up hope, for some good will come from the energies put into this campaign.

The troubles of the country have not been finally settled. In my opinion, capital and labor must work in harmony. They must try and see the troubles of each other; labor must not

feel that the burden is all upon its shoulders. Just as long as there is a lack of understanding on the part of labor that the employer has his troubles, and that these troubles are not beyond understanding at that, there will be useless waste of energy and strife between them. There is no mystery in any of these businesses; nothing that should not be fully discussed and as fully understood by labor. The one great principle should be fairness and I do hope that we American people will come to use the good sense that this great country has been the means of giving us, and that has been helped by the freedom that extends to the border lines of our wonderful country, and that common sense will prevail in the settlement of disputes that may confront us from time to time.

Blood cannot be extracted from a turnip; neither can an industry exist if the cost of production is more than the same value of the product. These facts cannot be ignored. Then why the unnecessary strife and bad feeling that is allowed to be born if the actual fact proves that there is only one way for a settlement?

I am a large employer of labor and am well versed in the trials of both sides; hence, my remarks as to the uselessness of disputes when the fact of a necessity for alteration can so easily be ascertained.

Our government has its troubles these days. Let us all do our part to relieve the strain upon those in Washington; by so doing we relieve ourselves of unnecessary strain also. President Harding has been good enough to write us suggesting that we take up certain matters during our week of deliberations here. We look upon this as a command and the American Mining Congress is ready to assist the government of the United States to the fullest extent at all times and I am sure that you will support me in this statement. I will ask our secretary to read the letter presently.

Now, before closing my remarks, I am going to take up your time for a moment to call attention to one member of this organization who is responsible for our being here today. It falls to the lot of some one man, or woman, in all businesses to be the real foundation upon which the business is built. Sometimes, very often, in fact, that one person is assisted by valuable assistants. Altogether they make a great success but

the one individual has organized, selected assistants, etc., and he, or she, is the brains behind the scenes without whose guiding spirit the business would fail to function. That man in the American Mining Congress is Mr. J. F. Callbreath, your ever faithful secretary, who does not save himself, but stands ever ready to protect this wonderful organization that is due to his untiring efforts. He is ably assisted and I can speak with some knowledge of him and them because I have been closely associated with the American Mining Congress for the past year. I just wanted you to know my opinion of your worthy secretary, who is too modest to speak for himself and who will not, perhaps, altogether like what I have said. I did not ask his permission; however, I believe in fair play and giving credit where credit is due.

Ladies and Gentlemen, I have great pleasure in introducing to you Mr. Francis S. Peabody, Chairman of the Illinois Committee on Arrangements for the American Mining Congress. (Applause.)

MR. FRANCIS S. PEABODY: Mr. Loring, Mr. Secretary, Ladies and Gentlemen, Members of the American Mining Congress:

I have been assigned the subject of "The Problems of the Mining Industry." I do not feel competent to discuss the problems of the entire mining industry, as my life has been devoted solely to the coal mining industry, therefore, I must be forgiven if I confine my remarks to the industry with which I am familiar.

For forty years I have been in the coal industry. Thirty-five of those years I spent my time trying to keep out of the hands of the sheriff by selling coal for more than it cost to produce. I recollect well in 1915 that my net profits for the year were 4 cents 5 mills per ton. The returns for the state were a fraction under 2 per cent on the investment; 35 per cent of the tonnage of the state was being mined by receivers or companies in a bankrupt condition. I cite this to show how closely the industry has been to bankruptcy.

For the last five years I have spent my time in trying to keep out of the hands of the Federal Trade Commission, or, in other words, to try to keep away from Government control of our industry.

It is the first time since 1917, when I went to Washington to

take over the supervision of the coal industry for the Government during the war, that I have felt that it was an opportune time to discuss, as a coal man, many of the problems that have been interjected into the coal business since the beginning of the war. During war times I felt that I, as a soldier, had no right to criticise my superior officers; I felt it my duty to obey orders and say nothing publicly that could be construed as criticism and that might bring about a worse condition than existed.

I believe, however, the time has now come when I, as a coal man and a private citizen, have a right to review some of the incidents of the war and also some of the problems that have been injected into the industry since the war.

A few days after this country became involved in the great World War, I was asked to accept Government service as Chairman of the Committee on Coal Production by the Council of National Defense. My official appointment by Newton D. Baker, President of the Council of National Defense, contained the following: "It is the desire of the Council of National Defense that you appoint your own committee to serve with you. The duty of the committee is to increase the output of coal and accelerate the movement of coal to points where the need is greatest."

My first experience was in connection with the supply of coal for the Navy. I found that the Navy Department had been unable to secure its coal supplies for that year. I learned that the Navy Department accepts coal from certain mines only, and that early in the Spring of that year indictments had been returned against practically all of the men operating mines producing Navy acceptable coal. It was alleged that these operators had agreed during the Winter upon a $3.00 price to take effect on April 1, 1917. On that date the open market price was $4.50. The Navy Department had advertised for bids, but received none from these operators on account of the law prohibiting the furnishing of supplies to the Government by anyone under Federal indictment.

I arranged a meeting between these operators and the Secretary of the Navy, at which meeting the operators agreed to furnish the Navy coal at $2.95. This was not acceptable to the Secretary of the Navy, and, after several days of negotiations, he made the statement that he had been informed that the cost of producing this coal was $1.72 and that he was willing to pay

the difference between $1.72 and $2.95, or $2.335 and proceeded to confiscate coal on that basis.

I understand that settlement has not as yet been made for thousands of tons of this coal so confiscated. I presume the claims of the operators will eventually be referred to the Court of Claims and there lost to the present generation.

The proudest moment of my life was on June 27, 1917, when I presided at a meeting of coal men congregated from all over the United States on the invitation of Secretary Lane, to discuss the war problems of the coal industry, and when that assembly, representing coal operators from all over the United States, put their business voluntarily into the hands of Secretary Lane, giving him authority to name the prices at which they could sell their product, I felt that the industry had set an example, never before set by any commercial industry in the world, of patriotism and self-sacrifice.

The result of the conference, as you all know, was the passing of a resolution, which resolution I had had approved by the Assistant Attorney General of the United States before presenting to the convention, who said to me the day before, "I cannot approve this in writing because the Attorney General's office never approves anything in writing, but there is absolutely nothing illegal in the resolution which you have presented to me." This resolution recited as follows:

"Therefore, Be It Resolved, That it is the sense of this meeting that a committee of seven for each coal producing state, and an additional committee of seven appointed by the representatives of the anthracite industry be appointed by the representatives of each state now attending this convention, to confer with the Secretary of the Interior, the Federal Trade Commission and the Committee on Coal Production of the Council of National Defense, to the end that production be stimulated and plans be perfected to provide adequate means of distribution, and, further, that these committees report forthwith to the Secretary of the Interior, the Federal Trade Commission, and the Committee on Coal Production of the Council of National Defense, costs of and conditions surrounding the production and distribution of coal in each district, and that these committees are authorized, in their discretion, to give assent to such maximum prices for coal f. o. b. cars at mines in the various districts as may be named by the Secretary of the Interior, the Federal Trade Commission, and the Committee on Coal Production of the Council of National Defense."

After the conference had adjourned committees were appointed from the various states represented in the conference, whose duty it was to confer with Secretary Lane and others appointed by Secretary Lane, and advise as to their costs of production in the various districts throughout the United States.

After having given the information to the Secretary, he determined on a schedule of prices that averaged approximately $3.00 per ton for mine run coal at the mines. Coal at that time was selling at from $4.00 to $8.00 a ton.

On the following day the conference ratified these prices and the operators present agreed that they would recognize those prices as the maximum in the sale of their coal. Newspapers all over the United States lauded the action of the coal operators and praised Secretary Lane for the wonderful work that he had been able to have done.

The following day a most bitter and virulent attack was made by Newton D. Baker, who was the head of the Council of Defense, on the work done by the coal operators. His statement contained the following: "The information I have from the Federal Trade Commission and other sources, I think, justifies me in believing that the price of $3.00 suggested or agreed on as a maximum is an exorbitant, unjust and oppressive price."

No one ever has been able to know the real cause for this virulent and uncalled for attack, especially, as the prices established by the Engineers' Committee of the Fuel Administration, which were made after a complete investigation of the costs in each district, equalled the average prices established by Secretary Lane and the operators, and in many cases exceeded the prices established for particular districts.

This letter of Baker's resulted immediately in cancellation of orders in many districts in the country, and, as the geological survey chart shows, production immediately diminished, thousands of people feeling, on reading Baker's letter, that coal prices would be lower.

On July 13th I wrote Mr. Gifford, Director of the Council of National Defense, referring to Baker's letter, one clause reading as follows: "Unless some definite announcement is made at once by the Council of National Defense, which will remove existing uncertainties and promptly re-establish the active production and distribution of coal, hardship and suffering will

result this winter." Everyone remembers the heatless days and lightless nights and the actual suffering and hardship in the Winter following.

The President's prices were announced on August 21, 1917. These prices were based on figures furnished by the Federal Trade Commission. There were prices established for 29 districts covering the entire United States. The Federal Trade Commission has since admitted that it had cost figures on about 10 per cent of the total production of the country.

A Fuel Administrator was appointed on August 23, 1917. Until the following spring, his organization consisted almost entirely of men brought from all industries except the coal industry. After the difficulties of that winter his organization was changed and from that time on was composed almost entirely of men connected with the coal industry.

The Engineers Committee of the Fuel Administration found it necessary to make 129 price divisions which the President, on advice of the Federal Trade Commission, covered with 29 divisions.

Our Committee discouraged the opening of new mines, feeling that this would decrease production as it would take out of actual production men to be used in development work and would decrease the supply of cars available for coal loading, through the additional service required from railroads in more thinly distributing their available supply.

During the summer of 1918 the Fuel Administration and Railroad Administration authorized the construction of tracks to serve 700 new coal mines. The number of shipping mines increased from 6,000 in 1916, to 10,000 in 1920. The excess capacity which caused most of our difficulties prior to 1915 is more pronounced today than ever before. The prices established by the Fuel Administration encouraged the opening of new mines and the extension of mines already in existence.

No sooner had we worked our way out of the Lever Bill, which was drawn to cover the period of the war, than we were confronted with bills for the control of the coal industry during peace times. Until recently, all of these bills have been proposed by men representing states which produce no coal.

The latest Senate bills, Nos. 2557 and 2558, were introduced by Senator Kenyon, of Iowa, a state which produces about one-

sixtieth of the total production of the country, which production is not sufficient to supply the state of Iowa.

Last winter we had the Calder bill, which was evidently written in connection with the housing investigation which the Calder committee had been making during the previous year. This bill authorized the President, in cases of emergency or threatened emergency, to fix prices, commissions and margins and to control the production and distribution of coal and provide for a drastic license system, and for a tax on dealers and jobbers.

Of all the proposals for government regulations of any industry up to that time, this one was the worst of the entire lot and would have done more injury to the industry than any other and eventually would have increased the cost of coal to the consumers and limited production so that there would have been a possibility of shortage almost every winter. The man who drafted that bill seemed to be clear as to how the maximum prices were to be established, but overlooked entirely that low prices on coal without coal being available gives but little comfort to the consumers.

The Frelinghuysen bill was less objectionable. It provided for the collection and publication of information on production and distribution. The main objection to this bill was not directed to any of its provisions, but it was looked upon by everyone in the industry as the stepping stone to complete government control. This bill, if passed, would have compelled the furnishing of information which we have been giving voluntarily for several years and on which the geological survey reports have been made. Our objection to furnishing cost figures to the Federal Trade Commission and the real reason for our taking into court the question of their right to demand such information was not that we were unwilling to make public our costs, but we were unwilling to keep three sets of books—one for the conduct of our own business, one for the Treasury Department and one for the Federal Trade Commission. We had then, and still have the feeling, that our cost figures, in the form acceptable to the Treasury Department, should also be acceptable to another branch of the government, the Federal Trade Commission.

The two Kenyon bills seem to be a consolidation of the Calder

bill and the Frelinghuysen bill, with an additional provision which would lead to nationalization of coal mines, which is the popular subject among the radical element of the United Mine Workers of America.

One of the Kenyon bills defines profiteering and punishes by fines and imprisonment anyone who sells coal for more than certain prices. Prices are to be based on cost, but the bill does not define cost. It states that cost shall not include interest on bond indebtedness, unreasonable charges or salaries. I presume it means unreasonable salaries, but who is to say what is an unreasonable salary? I believe the directors of any mining company are in a much better position to decide on the salaries which they pay their officials than any official of the government or commission to be appointed by the government.

This bill fixes margins to be allowed on the sale of various tonnages. Mines producing in excess of 5,000 tons a month are permitted a margin of 35c on the production up to 5,000 tons and 30c per ton on the remainder. It provides for a margin of 25c per ton on sales in excess of 60,000 tons per year. If we operate one month under this law, we are allowed 35c on 5,000 tons and 30c per ton on the remainder, but if we operate one year under this law we are allowed but 25c per ton on the entire sale.

I have not been able to figure from reading the bill just what it proposes to do with the difference of five and ten cents per ton, which the operator may legally keep in any month, but which he must not have in his possession at the end of the year.

I am wondering if the man who wrote this bill has ever seen any actual figures on the cost of producing coal. I am operating 14 mines in Central Illinois, all within a radius of 25 miles, and I have seen, time and again, the costs in that group of mines vary as much as $1.00 per ton. I presume that under this bill I would be expected to confine the margin on the low cost mines to the 25c per ton permitted for mines of that size, and to find someone who would be willing to pay $1.00 per ton more for the same grade of coal produced in the same district from some other mine.

One of the most difficult features in conducting the coal business is to ascertain costs in advance. We in the mining industry know the important part that idle time, accidents, etc., play in

our costs. It has been our custom for years to sell our coal around April 1st, for delivery one year hence, at fixed prices, subject to change only in the event of change in the wage agreement with our employees, which agreements have heretofore been made for two years. As I read this bill, if I should make a contract on April 1, at a price 25c per ton higher than the estimated cost, and then through additional investment, improvements in machinery, or increased efficiency could reduce that cost, I would be obliged to refund the difference to the buyer. The bill does not provide for the payment to me of prices based on increased cost. I am wondering how we would operate under this bill with market conditions such as we have had this year.

Screenings, which represent approximately 40 per cent of our product, have fallen in price in the last six months from $2.75 to 75c per ton. Needless to say the present-day market on that 40 per cent of our product represents a substantial loss. Working under this bill, what would be the incentive to reduce the cost of producing coal? What would be the incentive to invest a million dollars in a coal mine, such as has been done in hundreds of cases, to produce coal at low cost rather than have ten small mines costing $100,000 each, none of which separately or all of which combined, could produce coal at relatively low cost.

In this state we separate our coal into twelve different sizes. Some of those sizes naturally have greater heat value than others. Who will force the consumer to pay the same price for all of the sizes and who is to say which consumer shall take the sizes of least value? Are we to sell our twelve sizes at the same price, or are we to discard all of our cleaning and separating machinery and go back fifty years and ship only mine run coal, which would necessitate 90 per cent of the large consumers of coal changing their entire power plant?

Under this bill high grade gas or by-product coal, if shipped from a mine with low production cost, would be sold for less money than coal fit only for rough steam purposes produced at a mine with high production cost. This bill makes no distinction between coal of high grade preparation and that containing excessive impurities.

Coal is a seasonal commodity. The demand for it is always light between April and September with a sharp increase in

demand about September 1st and continuing for the next six months. Under this bill the low cost mines would sell their yearly output without much effort. The high cost mines could not operate during the summer. Who is to pay the cost of keeping those high cost mines in condition while not operating five months of the year? If this bill is enacted into law, I predict that in less than six months over half of the mines in this country will be closed and the Federal Trade Commission will determine that an emergency exists every winter. This bill would further aggravate the depressed condition which the coal industry has already reached, will force more wasteful methods of mining, more reckless operation of mines in states in which safety laws have not been enacted, and will tempt operators to evade the safety laws of other states; will remove all incentive to properly prepare and clean coal, as competition will then force all operators to produce their coal as cheaply as possible, as they could no longer rely on the natural average realization for their profit. The profit in all industry is derived from average returns.

The other Kenyon bill provides that whenever the Federal Trade Commission shall determine that an emergency exists, or threatens, and when such finding shall be confirmed by the President, the President may fix maximum prices, commissions and margins and deal in coal at reasonable prices, control the production, movement and distribution.

Who can conceive of the government creating over night a nation-wide organization to handle the distribution of coal produced in 28 states from the Atlantic to the Pacific, or would we have a nation-wide organization kept intact throughout the year so as to be ready to operate whenever the Federal Trade Commission determined that an emergency existed or threatened.

This bill further provides that whenever an emergency threatens which has arisen out of an industrial dispute between employers and employees, the President may take over the operation of any mines and shall pay just compensation for the use of such mining properties, and shall pay a fair living wage to the mine workers while he is operating the mines. What would the government consider just compensation and what would be the outcome of a dispute with the government on just compensation on a coal mining property?

Most of the miners' strikes of which I have any knowledge

have been caused not by the operators being unwilling to pay a living wage or the miners demanding more than a living wage, but by a difference of opinion between operators and miners as to what constitutes a living wage. Knowing the miners as I do, I doubt if in the event of a strike they would return to work for the President on a wage scale which they had refused to accept from the operators.

This bill sets up a tax on brokers and limits their margins. It would allow the same commission on coal sold in Chicago, where it can be handled in large volume and on a low sales expense per ton and the thinly settled districts of the West, where customers are often 100 miles apart and the cost of selling is ten times as great as in Chicago.

Section 13 of the bill provides that it shall be unlawful for any person that is delinquent more than ten days in shipment of coal on demand or requirement under contract, to sell or offer to sell coal for shipment at a higher price. This provision is not so objectionable. It is unnecessary as with margins limited the contract price and the open market price on coal from a particular mine would be the same, and if it was not, why give a dishonest operator nine days in which to disregard his contract obligations?

Generally on the question of government control of any industry from the railroads to the simplest problems of business control, there never has been a time when government control did not prove wasteful, not only of the resources of the industry it controls, but of the resources of the country.

When the government tries by statutory laws to regulate commerce in any form that will interfere with the world old law of supply and demand, it fails and always has failed. When the government makes laws for sanitation, for the safety of human lives, for pure food, for the conservation of water, timber, coal, etc., it is then within the scope of its useful work.

In the early part of my talk I referred to this being an opportune time to criticize. I now want to make personal criticism of former Secretary of War Baker, former Chairman of the Federal Trade Commission Colver. I believe those men are responsible for the extreme coal shortage in the winter of 1917 and 1918 and the hardships and suffering caused by it.

How different has been the attitude of Herbert Hoover as a

government official. Every man engaged in the industry of mining, whether metal or coal, is proud of Herbert Hoover—not only proud of his ability as a mining engineer, but proud of his clean, sound, constructive thinking of the problems that so beset the mining industry.

Now for minor problems of the industry. I say minor problems because I believe the most serious problem of all is governmental control and these minor problems which, prior to the war, were always with us and still are with us, have been relegated to the background as against the threatening problems brought about by suggested government control.

These are, first, the producing capacity of the coal mines of the United States is at present twice as large as the demands of the United States, including all possible export business, and every time a critical situation in the industry arises, whether through fear of strikes, car shortage, or situations brought about by government interference and the demand exceeds the temporary supply, additional production is developed. Think of it. Ten thousand coal mines in the United States today, as against six thousand mines at the beginning of the war, and realize that those six thousand mines at the beginning of the war, if operated 250 days per annum, were able at that time to supply the entire demands of the United States, including Europe, and the same thing is true now. Those six thousand mines could today take care of every ton of coal that can be burned in the United States and for export, even if business today were normal.

LABOR: There are enough miners in the mining and coal mining industry of the United States if the mines were worked 250 days per annum, to produce twice the amount of coal that the United States, including its exports, could use. What a problem, and who can solve it. How to support these men, in idleness half the time because they must earn during the period of their work sufficient to live during these idle days.

Union and non-union operators and miners: During periods of great demand the non-union operators pay premiums to take away from the union mines the labor that is so necessary. During bad times, when there is no demand, these same non-union operators force a reduction in wages and produce coal so much cheaper than those paying union wages can produce coal that their mines run full, while the union mines run less than 30 per cent. Can this problem be solved? I do not know. Certainly

not by government control of the wages or prices at which coal is sold.

Let us study for a minute the Sherman law and the Clayton bill. Let us see what effect these laws have upon our industry. They forbid combinations in restraint of trade, meaning thereby that men in a similar line of industry cannot get together and agree upon prices, cannot get together and agree upon the quantity of their production. How does this effect our industry? I do not believe it effects it in the slightest. There are 7,000 coal operators scattered throughout the United States, from Virginia and Maryland to the state of Washington, mining coal under dissimillar conditions, not only as to the physical problems of mining, but as to the quality and use of the coal produced—coal veins running from 24 inches to 50 feet in thickness, and with ash running from 2 per cent up to 25 per cent.

It seems incredible that a condition could exist whereby these men could even think of getting together on prices or production. But let us assume that it would be possible. What would be the result? During periods of great demand, prices would go up; not because of any combination, but because the demand is greater than the supply. During periods of depression prices would go down, because the demand was less than the supply.

To prove this, let me call attention to the provisions in the Clayton bill exempting farmers' organizations from the penalties of the bill, exempting labor organizations from the penalties of the bill—especially providing that labor is not a commodity, therefore no combination can be formed in restraint of trade. What is the result? Notwithstanding the farmer is allowed to combine, is allowed to hold back shipments of corn, etc., is allowed to combine on the price at which he shall sell his beef, or his corn, or his vegetables, or his grapes. Today corn is selling at 16c a bushel in Nebraska. Public utilities, villages and farmers are burning corn instead of coal. Do you think for one minute that if they could have made a combination that would hold, that we would not be paying $1.00 or $1.50 a bushel for that same corn? But no matter how hard they try to combine they cannot get away from the inexorable law of supply and demand, and if there is more corn than can be used, the price must go down.

Labor is the same. The unions are holding for $8.00, $9.00 and $10.00 a day for their men. With what result? Half of

their men are out of work today. Everything from the beginning of the world has been based upon the inevitable laws of supply and demand; the human mind can devise no method by which these laws can be supplanted.

There is no use in wasting time by legislation, commissions, and investigations, in trying to improve these world-wise problems. I have referred earlier to what I considered the legislative functions of any great nation were, and should be for the good of the people. The enforcement of sanitary laws, the enforcement of the keeping of peace, the making of laws to give pure food and pure drink to the people of the nations. To make laws preventing the destruction of forests without their replacement. To make laws for the conservation of the water powers of the country. To make laws for the safety of the people employed in a hazardous enterprise, to make laws for the conservation of the mineral resources of the country. Conservation of life, conservation of virgin deposits of the earth, these should be the problems that should be solved by the government.

Today if a penalty was imposed upon the leaving in the mine of any tons of mineable coal in the United States, and such a law is possible to make, and possible to administer, we would save 40 per cent of the deposit that now goes to waste through recklessness, careless mining, thus preventing the waste of coal now unmined and that never can be mined if present methods continue. If universal safety laws are adopted and enforced by the government of the United States and the states, I believe 90 per cent of these casualties and deaths of our hazardous business would be avoided.

I believe a commission, as much as I abhor the name, and as much as I abhor the usual results of the findings of commissions, should be appointed by this Congress to study from the broadest standpoint, the saving and conservation of the mineral resources of the country and the saving and conservation of the lives of men employed in those industries; to make clear, concise recommendations for the passage of federal and state laws that will result in the saving for the future generations of the fuel of the country and saving for the present generations the lives of the men employed in the industry.

CHAIRMAN LORING: I am sure you will agree with me that Mr. Peabody's remarks have been illuminating.

I have great pleasure in introducing to you Mr. Edwin Ludlow, President of the American Institute of Mining and Metallurgical Engineers. (Applause.)

MR. EDWIN LUDLOW: Mr. Chairman, Mr. Sceretary, Ladies and Gentlemen: There is one feature of Mr. Peabody's remarks that I would like to elaborate on a little bit, and that was that after Mr. Garfield had appointed his Engineering Commission, of Mr. Allport, Mr. Geicher and Mr. Norris, and had really scientifically and carefully gone over the cost sheets of the coal operators of the country and arrived at an average cost and an average selling price, it was found that that selling price was within a very few cents of the price that had been named by the Lane-Peabody Committee. (Applause.)

The American Institute of Mining and Metallurgical Engineers held last month a meeting at Wilkes-Barre, Pa., celebrating the fiftieth anniversary of its organization in that city in 1871. The great growth of our Institute is shown by its increased membership from the twenty-three men interested in coal and iron who formed the original body to the 10,000 members that we now have, representing every branch of the mining industry and located not only in every part of this country, but all over the world.

There were features of peculiar interest to the visiting engineers that made the anthracite region seem unique in this time of trouble and depression. We found that car shortage is almost unknown; that market conditions have not interfered with continuous operation, and that, instead of the decreasing selling price that has been felt so severely in the bituminous field, the price has advanced during the summer 10 cents per ton each month. There has been practically no idle time during this summer that has seen less than half time in the bituminous field, and yet the same law of supply and demand—a law that is more stable than any act of Congress—governs both the anthracite and bituminous fields.

The demand for anthracite coal as a domestic fuel in New England, the Atlantic Seaboard and also in the Middle West has kept on increasing as the population has increased, but the output of the domestic sizes reached its maximum several years ago and there are no new fields to be developed and mining is growing more expensive as it goes deeper. In some of the

fields the coal companies are now mining veins two or three feet thick which were considered unworkable in the years gone by, and yet with all of that development and the strain to produce every ton possible, the market absorbs the output, as it seems to have learned its lesson that it must buy the anthracite when it is available and store it, otherwise enough cannot be produced to fill the demand.

The situation from all points, except the labor point of view, is, therefore, a very satisfactory one in the anthracite region. Labor, however, is thoroughly organized, and is making demands for a scale of wages to be put into effect next April that, if agreed to, would make the cost of anthracite almost prohibitive as a fuel. The public has been educated to the idea that labor troubles at coal mines are largely due to the broken time and few working days in the bituminous field. That full working time does not make the laborer contented is shown by the fact that the Lehigh Valley Company had in August eleven collieries on strike, representing 8,000 men, and the cause of the strike was the question of the seniority of a slate picker boy in one of the breakers. The Lehigh Coal and Navigation Co. had all of their mines idle for a week, throwing 6,000 men out of work. The cause of their strike was the question as to whether two men should be paid for some coal that fell, to obtain which they had not done any work. Questions such as these the contract with the miners requires should be referred to the Conciliation Board for adjustment, but the miners, feeling they could not win on such questions, go out on strike and at least a week's work is lost persuading them to refer the grievance to the Board.

The average wages in the anthracite region, though less per day than in the bituminous field, are much higher per annum on account of continuous work, and the cause of these strikes may be attributed more to too great prosperity than to dissatisfaction with working conditions.

The situation in the bituminous field is not a particularly cheerful one. During the strike in the British mines there was quite a large export trade that was of great assistance to some of the fields, but the English mines are now recovering their export trade, and they will win it back, not from the fact of their being able to produce the coal any cheaper or of any better

quality, but because they are able to barter their coal to obtain return freight for their vessels and do not have to demand the cash settlements that are required in exporting from this country. The foreign countries are so depleted in cash that they must pay their bills with what they have to sell. It is a case of old-fashioned barter and we, with the tariff wall we are building around us, barring out manufactures and having a surplus of all raw material, are not in a position to barter. We cannot compete with the English mines who ship coal into Sweden and bring their vessels back loaded with lumber. We cannot compete in the Argentine with the vessels going out loaded with coal and returning loaded with wheat. And so it is in most parts of the world, we must face the situation as being one that necessitates our mining coal for the requirements of our own country with only a very small proportion that can be shipped to any foreign port. As our average consumption is only about 500 million tons and the capacity of our mines, running full time, is double that, the possibilities for steady operation are far from bright.

There is another feature that must be considered, and that is that the miners' organization in this country is international and co-operates with the English miners. It was under instructions from the international meeting held in England in the spring of 1919 that the orders went forth for the nationalization of coal mines in all countries, and our delegates were instructed to make a demand in the fall that would be so exorbitant that the operators could not concede it, and, if they refused, to call a strike on the 1st of November with the expectation that the requirements of the country to keep the railroads and public utilities going would necessitate the taking over of the mines by the government. There was only one thing that prevented the carrying out of this program and that was the open shop mines in West Virginia and Pennsylvania that, formerly, had produced about 30 per cent of the tonnage of the bituminous coal, and who, during the six weeks the strike lasted, were able to bring the output up to 50 per cent and by that means were able to keep the railroads and public utilities in operation. If it had not been for these open shop mines the industries of our country would have been closed down just at the beginning of the winter season and we might have had to make some such

agreement as has been recently made by the British government with the miners, by which they presented them with 50 million dollars and obligated the mine operators to pay out 83 per cent of their profits to the wage earners, retaining only 17 per cent for their own fixed charges. The miners of this country are watching the development of this agreement with the English miners, and when the time comes for the bargaining across the table on the 1st of next April, the demands will be largely formulated by the results of this agreement and the English miners will use their influence to minimize the competition from this country.

The most important feature in connection with the reconstruction of our whole industrial system that was disrupted by the war is the question of labor, which is fighting to retain every advantage the war gave it. We are now faced with the fact that the raw material produced by the farmer, by the metal miner and, to a certain extent, by the coal miner, is being sold at cost or less, but the manufactured article has not come down in proportion to the fall in the raw material, due to the high wages that are paid in every industry, especially in coal mines and on the railroads. Reduction in wages would reduce the cost of living, and unless these wages are brought down, the cost of living cannot be brought back to the pre-war basis and we cannot hope for the stabilization of our industry until this has been accomplished. The period of hard times that we have gone through has seemed long and we all look ahead for better conditions, but it would be a mistake if those conditions should improve too rapidly until the labor situation has been liquidated and its efficiency brought back.

The most dangerous doctrine that we are called on to face is the minimum wage based on an assumed standard of living, that must be paid whether the laborer produces the value of his wage or not. The acceptance of that theory can lead only to sovietism. If the laborer is paid more than the value of his product, the operation soon becomes bankrupt unless the difference is made up, and the only unlimited pocket book is the U. S. Treasury. In that lies the kernel of the demands for nationalization by the coal miners and railroad employees.

CHAIRMAN LORING: If anybody wishes to discuss any-

thing at these meetings, we shall be glad to allow each speaker three minutes.

I will now call on our Secretary to read the letter from President Harding that I referred to in my opening remarks. He also has some announcements to make that I would like you to hear before leaving.

SECRETARY CALLBREATH: Mr. Chairman, Ladies and Gentlemen: I want first to announce or request of you that the Resolutions Committee shall be properly provided for. The Resolutions Committee of the American Mining Congress is so fixed by our by-laws that it is representative of the industry at large with no control whatever from the central office. Therefore, we ask that the delegations from each state shall, independent of all influences, select the man from their state who is best fitted to serve upon the Resolutions Committee. May I say to you that the Resolutions Committee requires the best brains and the best men that you have. I would, therefore, ask each delegation to assemble and to select the man whom they would like to have serve upon the Resolutions Committee and have that name presented at the opening of the next session of the Congress this evening.

May I say that we have two programs, the program of the special sessions, the special conferences, and the regular program. These special programs have just been issued and some are at the left and I desire that each of you shall be provided with one. If you will watch the program carefully, you will know what is coming ahead. We have the conferences of the different divisions this afternoon at the Congress Hotel and the regular session here in the evening.

I am glad to say to you that this morning you have had three wonderful addresses, representing the three great divisions of the country—a big man from the Pacific Coast, a big man from the Central part of the nation, a big man from the East, and I know you have been wonderfully pleased and interested in these addresses.

I am going to ask you, Mr. Chairman, if you will permit me to express a special word of appreciation. If I may rise to poetry for one moment, I want to quote Pope in his essay on man who said, "Oh! blindness to the future! kindly given each may fill the circle marked by heaven." I will not finish the quotation,

but most of you will recall it. I want to express my particular appreciation that one of your speakers, forty-one years ago, when he went into the coal business, did not know the tribulations that were ahead of him and did not go into politics. We are particularly thankful for that fact that he did not go into politics and that he has mastered the details of this most important business to the nation in such a way as to give us the wonderful address we have had from him this morning. What I mean to say is that if he had gone into politics he would not have had the money available which was necessary to enable him to render the help to the American Mining Congress which has enabled us to finance this great Convention and this great exposition. The American Mining Congress expects to pay its own way but we have not any money for big enterprises, and when it was found here that it was necessary to have from seven to fifteen thousand dollars in order to do the preliminary work necessary for this Convention and this exposition, Mr. Peabody said, "I will furnish the money." (Applause.) I want to pay special tribute to Mr. Peabody for that.

We expect to pay Mr. Peabody back and thanks to all our good friends we are going to be able to do this, but he did finance us through this enterprise and I feel we are under special obligation to him and we are glad indeed that forty-one years ago he did not go into politics instead of into coal.

The Chairman requested that I read the letter from President Harding. Unfortunately, a real good newspaper friend borrowed it but it will be read this afternoon at the Coal Conference.

The meeting adjourned at eleven-forty-five a. m.

SECOND GENERAL SESSION

TUESDAY EVENING, OCTOBER 18, 1921

The second general session of the convention convened in the convention hall of the Coliseum at 8:30 p. m., Mr. W. J. Loring presiding.

CHAIRMAN LORING: The secretary has some matters which he desires to present.

SECRETARY CALLBREATH: The first business before the meeting this evening is the naming of the Resolutions Committee. The Resolutions Committee, I may repeat, consists of one man from each state selected by the delegation from that state present at the convention. I will call the roll of states and those who have selected their member of the Resolutions Committee will kindly arise and give the name of such member.

Several of the states named their representatives on the Resolutions Committee.

SECRETARY CALLBREATH: Gentlemen, the most important work of the convention is being sadly neglected. It will be necessary for the different states to name their members of the Resolutions Committee, and I trust that before the meeting in the morning every state will be ready to name its member of the Resolutions Committee. Without that naming, that part of the convention work cannot proceed, because the Resolutions Committee is that body which passes upon every resolution which is presented to the convention.

May I say now that those who have matters upon which they desire to have the official action of the organization must present those matters in the form of a resolution in writing; and the by-laws require that they shall be referred to the Committee on Resolutions without debate. I repeat, every person having any matter which he desires brought before the convention in an official way, must prepare it in writing and have it introduced as a resolution, to be referred to the Resolutions Committee. The Resolutions Committee must be selected very shortly. We hope that every state will present its committeeman in the morning. Where there is only one delegate from a state, his modesty must be laid aside and he must be the man to represent

that state upon the Resolutions Committee. If he does not do that, the secretary will do that for him.

MR. C. O. BARTLETT: Let me make a suggestion that the men from the different states get together in this room after this meeting. It is pretty hard to get together at the different hotels.

SECRETARY CALLBREATH: It has been suggested that after the meeting the members of the different delegations shall assemble here in the room and select their member of the Resolutions Committee.

CHAIRMAN LORING: Ladies and gentlemen, I have great pleasure in introducing to you the youngest governor in the United States—Hon. J. A. O. Preus, governor of Minnesota.

GOVERNOR J. A. O. PREUS: Mr. Chairman, Ladies and Gentlemen: I thank you very much. It has always been my observation, however, that the man who gets applause when he commences his remarks fails to get it when he quits; or if he does get it, it is because he gets through. (Laughter.)

Mr. Porter called on me some weeks ago and asked me if I would not come down here and make a few remarks to the American Mining Congress some time this week, and I very gladly accepted the invitation to come. The reason for that is, you know a man does not remain governor for life. There are too many people who want the job; you stay there a short time and then you get out. The result is, when you have an opportunity where you don't have to listen to other people speak (I would much rather make a speech myself than do that), why, you generally accept.

The governor, you know, is a man whose office is continually renewed. I heard the chancellor of the University of Montana a short time ago tell the reason why a man who holds the position of governor invariably accepts an invitation to speak when he has an opportunity. He said, "It is because they renew them so frequently."

I happen to be one of those persons who has held public office for a long time. I presume the reason I was asked to come here and talk to you was that for a period of six years I was state auditor of Minnesota and ex-officio in charge of the public domain of that state, or land commission. The State of Minnesota is in a little different position from most of the other states

by reason of the fact that its land grants have been preserved quite differently from the other states that have gotten valuable grants in Congress.

In 1858, when the people of Minnesota became desirous (it was then a territory) of having the territory become a state in the Union, they petitioned Congress in the regular fashion, and Congress said in the enabling act, "If you people of Minnesota wish to organize as a state in the Union, you may do so, and we will give you, after you have given us all the land of the state, sections 16 and 36 of every township, provided you will devote the proceeds of the sale of those lands to school purposes." Minnesota accepted and became a state in the Union, and sections 16 and 36 were promptly given to the state. Since that time the swamp land act of Oregon, as it is generally called in Arkansas, was extended to the State of Minnesota, and in all, out of our 51,000,000 acres of land, approximately 8,000,000 acres was given to the state.

The forefathers in Minnesota were long-headed and they were unselfish. So instead of doing what all states had done previously to that time, selling their lands as quickly as possible and taking the proceeds of the sale of these lands and spending it at once, Minnesota said, "No, we will not do that. Let us take these funds, invest them in 4 per cent bonds—government bonds or state bonds—and then devote the proceeds from the sale of these bonds to the education of the children of Minnesota in the future."

That became a constitutional provision in 1887 and the result is that Minnesota has not squandered the proceeds of the sale of state lands, but has the money invested in excellent government and state and municipal bonds, bearing a little better than 4 per cent interest on the average, I think, at this time, and we have about $42,000,000 now invested in a permanent school fund, guaranteeing to the children of Minnesota an education in the future.

It is an example that could have been followed by more states than have followed it. By reason of that fact, however, Minnesota was watchful of another situation. Iron ore, as you know, was discovered in the northern part of the state many years ago, and a wise state auditor said: "Let us not sell the lands in that part of the state, but preserve them and see if we can't discover

some iron ore on the state lands. Let us not sell these lands at $5 an acre." And they didn't.

The result is that today, I think, Minnesota has about thirty-eight mines, iron mines, with the title in the State of Minnesota, the state keeping the fee, but leasing the mines to the steel companies. It was then, as a manager, I might say, of the fee interests of the state, that I got in contact somewhat with the mining industry in this country.

When I was invited to come here to address you, I asked one thing particularly, as you have probably already observed, that I might be relieved of preparing a set speech and talk to you very frankly about a peculiar situation in regard to government and industry in the State of Minnesota, as we have had it in the last few years.

About two years ago I traveled on a train in Northern Minnesota and I sat down next to a man who took most of the seat; and finally, however, he looked over at me and said, "Aren't you Mr. Preus?" I said "Yes." He said, "I have been very anxious to meet you and I am very glad to meet you now. My name is So-and-So, and, as you know, I am one of the leaders of the Non-Partisan League in this state. I have been anxious to meet you, because you are a young man and I have every reason to believe that you are honest and well-intentioned, but you have the craziest viewpoint of public duty of any human being I have ever heard of in my life. You had the opportunity such as has never been given to any man in this country, as I see it, for by a stroke of the pen you could have done something for the people of your state whom you claim to represent, and you failed in the great opportunity."

I said, "All right; proceed." He said, "A few years ago, when you were state auditor, the village of Hibbing (which is the richest village in the world, by the way), through its mayor, asked you to cancel the iron ore leases of mines lying underneath the area covered by the village of Hibbing, and some outside, and you had the right to cancel those leases; and you could probably have brought back to the people of Minnesota property valued at more than $100,000,000. Now, why didn't you do it? I would like to get your viewpoint."

Well, this was the situation: There is a provision in the iron ore leases of the State of Minnesota to this effect: That the state auditor may cancel off a lease and nullify its force and effect so far

as the lessee is concerned if the lessee fails to pay his taxes. Now, in the village of Hibbing they spend a good deal of money, as some of you who are in the mining business and have properties within the city limits of the city or village may know.

At that time Hibbing had a population of about 10,000. The per capita tax for municipal and school purposes, I think, combined was $210, approximately. The per capita tax of the average village in the State of Minnesota was considerably less than $10, as I recall it, but the per capita tax in Hibbing exceeded the per capita wage which the people in Hibbing, all of them combined, got in during the year. It was, consequently, an exceedingly heavy tax.

The village was improved in good shape. There are more pavements there, I think, than in any village of its size in the world. They had more incandescent lamps on the street corners with their 10,000 people than they had in the city of Cincinnati. They are building the finest school buildings on earth there at the present time, to cost more than $3,000,000, and they had expended money for various purposes. They had several fire departments and they had a majority of the voters on the payroll of the city, a very large majority, too, and it guaranteed the people in power re-election whenever a vote of confidence should be required.

So an appeal was made to me, when the mining companies declined to pay their taxes (because they wanted to take the question into the courts to determine whether or not these taxes were confiscatory), through the president of the village to cancel those leases in the interest of the people. I declined to do that in the interest of the people of Hibbing, because I felt the mining companies were entitled to their day in court, like any other person who has property, and we all have the right of property. I declined to do it, and since that time it has frequently been said in Minnesota that I was friendly to the Steel Corporation.

So, sitting at the side of this gentleman in this train on that day, I explained these facts to him. He said, "Well, it does not make any difference. I see your viewpoint, but mine is different. You just wait, young man, till the Non-Partisan League gets hold of the government of the State of Minnesota and see what we will do. We are going to levy a tonnage tax on iron ore. First, we are going to make it a low tax, and then we are going to have the state run those mines, and when we have educated our people to run them, then we are going to bring it up quickly so we can confiscate all of those properties, and the people of Minnesota will then be in

possession of those things which they unwisely dispossessed themselves of in the past. That is what is going to happen in Minnesota.

So I commenced to give some time and attention to this organization known as the Non-Partisan League, the first great effort in America, brought forth by that organization, and quite effectively, too, to overthrow our form of government and to give us another form of government. You who are interested in industries can well give a little thought and attention to the audacious ideals, you might say, of those people up there who have sought to overthrow our form of government and have done so to a very great extent in the State of North Dakota.

I found at once that in the organization of this Non-Partisan League the leaders were Socialists, nearly all of them, and I proceeded to study Socialism a little bit. What is Socialism, when you analyze it briefly, as contrasted with our form of government? Possibly I should ask first, what kind of government have we? I think our form of government and its ideals are best given to us in the Declaration of Independence in these words which guarantee to you the "right of life, liberty and the pursuit of happiness"; but as expressed by those who wrote the Declaration of Independence it was not entirely new in literature or in government.

That phrase is taken from the old Jewish Talmud and in the old Hebraic it reads that a person "shall have the right of life, liberty and private property." The people who came to America in its early history came here because, not that they wanted private property so much, but they wanted the right to worship as they pleased. It was that which brought the Pilgrim Fathers to New England; it brought the Quakers under William Penn to Pennsylvania; it brought the Campbellites to Virginia and the Catholics to Maryland. However, the people who have come to the great Northwest in the last century have come there not to get religious liberties, but they have come there for economic reasons, believing they could get more of private property in America than in the countries from which they hailed in the Old World.

That being the case, it is up to those people particularly, it struck me, to realize what one of the ideals of America is, namely, that of having private property. So I endeavored to contrast it with Socialism, which is the right of society to own all producing property jointly and getting an equal distribution of the proceeds. That is the difference between our form of government and the ideals laid down by our forefathers and the ideals of Socialists.

That is Socialism of today and has been so since the father of Socialism lived, Karl Marx, for he defined it in practically the same words.

I discovered, then, that the leaders of the Non-Partisan League were Socialists to a man and that they believed in Socialism, and that they wanted to give us complete Socialism and destroy the right of private property in Minnesota. This was one indication, proceeding at this one industry, lying in a remote part of the state, where they found it easy to strike; then they would proceed against all industries and all natural resources of the earth, as Socialists will do.

These Non-Partisan Leaguers, as they are called, would go to the farmers and say: "The system of government must be changed somewhat," and they pointed out different things to the farmers. For instance, they would say, "You have on your feet a pair of shoes; you get 36 cents for the hides that go into those shoes, and what do you pay for them? Twelve dollars. There is too wide a spread between what the farmer gets and what the man gets who finishes the product. Let's do away with that."

Their program practically became this in Minnesota: Let the State of Minnesota purchase from the farmers whatever they produce; let the State of Minnesota manufacture the raw product into the finished product and cut out all the middlemen and the state become the distributor, and then all of the people, the producers, will get the benefit that they are entitled to for the work which they do.

It was a hard proposition to combat—an exceedingly difficult one. The next time they would come to the farmer and say, "Mr. Farmer, how much did you pay for that suit of clothes?"

"Fifty dollars."

"Yes. There isn't more than $4 worth of wool in it. That is all that you got for the wool that you sold. We can correct that for you. The way to do it is this: Let the State of Minnesota buy all the wool in the state and manufacture it into a finished product."

And so they proceeded and they had a program which practically meant that the state should buy everything which the farmer produces, manufacture them into the finished product and redistribute, which, as you can easily see, is complete Socialism. Not only were their leaders Socialists, but they endeavored to spread this propa-

ganda and get as much prestige for it as possible. Very fortunately, they held a convention up there in St. Paul, a very large convention, in an auditorium there seating 8,000 people, and it was filled to the roof. That was on the 19th day of March, 1918.

When that convention was held, a resolution was passed by the convention, reading as follows:

"We extend greetings and pledge our support to all the forces which are struggling for democracy, and especially to the people of Russia, whose government is now beset by foes from within and without."

So we proceeded to look at that form of government over there in detail and bring it to our farmers in Minnesota—whether they wanted our form of government or whether they really wanted to pledge their support and extend their greetings to those people over there. We took the constitution of Russia and brought it bodily to those people. We pointed out that form of government, first, as regards the franchise, that no person should be permitted to vote, as is the case in Russia under its present constitution, unless he surrenders the right to make money out of the services of any other person. As you know, you cannot vote over there under that constitution if you get any proceeds from any investment. If you owned one hundred dollars' worth of Liberty Bonds over in Russia and you got four dollars a year interest thereon, you would be deprived of the right to vote. If you had a man working for you on property which you claim is your own, and if you make money from his services, you are deprived of the right to vote.

They proceeded further over there, as we all know. Let us take, for instance, their proceedings against the church property. They deprived the clergy of the right to vote because they were not engaged in a useful occupation and were non-producers. That is the logic of it. Then they did not stop there. They were anxious to realize their fullest ideals and they had a great opportunity over there in Russia. In discussing government in these states up there we have called attention to it and, I think, rightly so.

No well informed Socialist will deny—in fact, he will assert—that the father of Socialism is Karl Marx and that the bible of Socialism is the communist manifesto which Karl Marx and Frederick Engel gave to the world over in London in 1847. The communist manifesto declares against the right to own property for

gain and declares specifically for Socialism, as I have heretofore explained or defined it.

Karl Marx back in 1845 made this statement: "We can know nothing of God. Socialism destroys all religion and all morality." Frederick Engel says: "There are three things which stand in the way of human progress, three things which block the way to human progress. They are private property, religion and marriage."

So we endeavored to find out and analyze that proposition and find out the reasons for it. Why should that be necessary? If you stop to analyze it, you will see that you cannot take out of anyone's heart the desire for private property as long as they have family obligations. When I was a youngster and unmarried I had no money. I cared nothing about having private property. I wanted to make all the money that I could in order that I might spend it as I went along. Then I got married and I developed a desire for private property, which I had not had before. I wanted a roof over my head and I wanted a home of my own. I wanted some furniture and I wanted a little money in the bank. I took out some life insurance. Even then my wife and myself didn't care so much about private property. We sat around for a number of years—twelve, in fact—waiting for the arrival of a greater desire for private property and finally we got one on the eighth of January last year. (Applause.)

You know, the first thing I did after I had seen that youngster and assured myself that he resembled his mother instead of his father, the very next thing I did was to go down and see a friend of mine who was a life insurance man and I took out a life insurance policy that would guarantee that youngster an education in case I should pass away. A desire for private property had come to me that morning stronger than I ever had before in my life. So you see, as long as you have family ties and obligations, you are going to have the desire for private property just exactly as I had it and you won't have the desire for public property nearly as strongly.

Therefore, the Socialists reason that there lies the blessing of communism, of Socialism, of destroying all rights to private property, including inheritance, which is so wonderful that if necessary we will have to destroy the family in order to bring about this Utopia of ours. That is why Karl Marx said what he did.

But why should they attack the church? Why, for the same reason The church teaches that there should be family ties and

obligations and instructs us in the rules of morality. They must strike at the church because the church insists that we shall live the lives we do and have the system which we have in America—that of monogamy.

So every Socialist will tell you that it is correct that from their viewpoint the three things which block the way to human progress are marriage, private property and religion. Over there in Russia they saw that and they wanted to show the world that their great ideal was Karl Marx, he who said, "We can know nothing of God. Socialism destroys all religion and all morality." On Easter morning under the old regime they had been in the habit of instructing the newspapers under the influence of the government to print these words in bold type across the front page, "Christ is Risen." On Easter morning when the Socialists took charge they ordered the newspapers not to print that sacred sentiment but to print these words instead, "One hundred years ago Karl Marx was born." So there you have the contrast in ideals of a Christian nation such as we have here and a pagan one such as they want over there.

They proceeded, then, directly against the church. They confiscated all church property, deprived the clergy of the right to vote. They slammed the doors of the churches shut and said, "You shall not teach religion in public." They proceeded against the family in a very sinister but underhanded way. They did not abolish marriage, but they said, "If you want to be married, you can't be married by a priest or a minister. You are still single if you are married that way. It won't hurt you any, but you are still single." However, that is not so important. It is easy to get married in America. It is sometimes too easy. But here is the way they proceed over there. They make marriage and divorce purely a matter of registration. If you want to get married in Russia, what you do is practically this: You go up to the city clerk with the girl you want to marry, and say, "We want to be married." You put your name on a register and you are married. You have a row inside of a week, which you all know usually takes place the first week. (Laughter.) Then one of the parties wants a divorce, perhaps both of them. They go back where they registered. They register again and then they are single. If they are not agreed on it, one may go back there and register, and then they are both single.

That is worthy of serious reflection. I am not a lover of great wealth. Otherwise I certainly would not have been in politics. I am not a lover of great wealth in certain families or in certain hands, but I do believe in the right to own private property and that it is a great privilege to be protected in that right as we are in America. There is one thing we want in this world, and that is happiness. For me it would not be found in great wealth, and I do not believe that it is found for anyone in great wealth. I do not believe that happiness is found in the ownership of a railroad or a great mine or a great business or a great farm. I believe that happiness is found in the average clean, moral home. (Applause.)

If out of my life should be taken the association with five brothers and two sisters, a wonderful father and a lovely mother, a good wife and the finest boy on earth—if you were to take that out of my life, I should then only hope to shuffle off this mortal coil. Those are the institutions in this mortal world which are worth while, in my mind, and yet right up here in the sister State of Illinois we have a coterie of men holding this convention, and you know how resolutions are passed. Somebody will write them and the rest of you will vote for them, but you won't read them. That is what happened up there and that is why they extended their greetings and pledged their support to that government over there which is of the kind that I have explained to you. We put this contrast up to the people of Minnesota in the interest of our form of government because we believe our form of government should be maintained. We won out in the primaries by 8,500 votes, but in the general election, when the women voted, we won out by 135,000. (Applause.)

It speaks well for the men up there, because it shows that the women are happy in their homes. (Laughter and applause.)

We brought them a proposal up there instead of that of state Socialism, and it as co-operative marketing and manufacturing, if they wished, among the farmers. It could well be done in Minnesota, for this reason: In Minnesota 68 per cent of the people live in the cities and 32 per cent of the people live in the country. If we had state Socialism in Minnesota, it would be run by the people in the cities who want to buy everything they get as cheaply as they can, as against the farmer by a vote of two to one, practically, and the farmer wants to get the highest possible price for everything he produces, so they could

understand that. So we suggested co-operative marketing to them.

After we had passed laws providing therefor, we urged our farmers to organize co-operative institutions and themselves thereby to enter into direct competition with the middlemen whom they object to at the present time and who they feel get too much of the money that is paid for the finished product, while the farmer gets too little.

The farmers in Minnesota and the Dakotas have had just grievances in the past. The farmers who joined this league and belong to it are as good citizens as we have in Minnesota or anywhere else, but these people coming to them with the specious argument that the price of hides and the price of wool is so on and so forth and giving them a remedy which is worse than the disease, pretty nearly did business in the State of Minnesota in the primaries last year. I shall not discuss the situation in North Dakota, nor say how far they have proceeded. Suffice it to say that Mr. Mills, for instance, was the legislative adviser up there and one of the leading Socialists in America, a man who advocates in his book, entitled "The Struggle for Existence," the public ownership of even farm lands. I think it is in paragraph 498 of chapter 28 where he says, "Under Socialism the public will own the industries and there will be no interest to pay." That is the viewpoint of the man who was leading the legislature of North Dakota during the last two sessions because he was the paid legislative adviser to those people up there. They have tried to give to the people of North Dakota such doses as the traffic would stand, if you please, of Socialism.

Now I have spoken on government for a while. I have tried to tell you of a serious situation which we have had. If they could have won in Minnesota, and if they had won in the primaries, there would be no question about it in the election, because our state went 345,000, I think it was, Republican. They would have endeavored to try out those experiments in that wonderful state. We are not only an agricultural state, as you know, but all the way from 50 to 70 per cent of the iron ore in the United States is produced in Minnesota, which is pretty close to one-fourth of that produced in the world. Also we have that wonderful school fund of $42,000,000, and if they could have

gotten their hands on that you can easily see what might have happened in the other states around here.

Here was a real effort to overthrow our form of government which gives the right to private ownership in industries, and to substitute for it another form. So we had a great struggle which might well have spread elsewhere, and certainly would have if they had been victorious there. Therefore, we feel that we have discussed government, the foundation of government, a little more up there than possibly anywhere else in the United States for a long time, for this is the first time in the history of any state in the Union that a real effort has been made to overthrow our form of government and to give us another form.

I am delighted to have been with you here this evening, because I wish to urge just one thought upon you in conclusion, and that it this one: Here in America every person is sovereign; here in America every person has as great an obligation toward his country—toward knowing its welfare, its government and constitution, and in the way of contributing his mental attainments toward its government. Each man must do his part for the government, otherwise we cannot have any. When this government was organized, it was with the idea that all people were to have a hand in running it. We were laughed at and jeered at by every court in Europe. They said, "Why, that government can't exist, because the people are not smart enough to govern themselves. It will crumble away and disappear." But, my friends, the United States of America has demonstrated that this form of government has given more happiness to more people in a century and a half than has any form of government in the history of the world. (Applause.)

So you see, when the colonists freed themselves from foreign rule in America, here was an experiment with a number of people not greater than the number that are now in the city of Chicago. Over there you have an experiment involving 180,000,000, and avowedly their program is to foist that same form of government upon every country in the world. They started here up in little Minnesota and in North Dakota. They hoped, and said so, that they expected within a very reasonable time to change the entire government in the United States. Then where would your industries have been? In the hands of the

government, and I need not tell you people the fallacy of any proposition such as that. It is absurd and ridiculous.

So I ask you gentlemen who are engaged in industries, business men, that as the foundation of your activities in your industries you place your duties to your government. You ought to let people know what this government is and to contribute your share to taking an active part in political affairs. There is no human being I despise more than a business man who says, "I don't pay any attention to politics." He is not doing his duty toward his country. (Applause.) You and I have precisely the same obligations toward this government in the way of knowing its affairs and you should know them as well as you know your own industry, because it is basic in your industry and we don't want what we have in America destroyed.

Let us be true to the ideals of the Declaration of Independence, the right to life, liberty and private property. Let us continue to maintain this form of government, perfecting it from day to day as we proceed in our lives. Let us not be ashamed of our form of government or our activities therein. I was introduced the other night at a banquet as a politician, pure and simple. I guess that did not get across. (Laughter.) Don't take offense at that, but take a part in the functions of your government and let us continue to honor the founders of our government. Let us continue to revere their memory and let us not destroy their handiwork. Let not all that has been built up here become merely a memory, but let us continue to do our share, let us build here the greatest nation for the greatest number of any country in the world, and let us hold high the torch of liberty, inviting the people of the earth either to come here and enjoy our blessings, or to assume unto themselves the blessings which we have and which we can give them in the teachings of government. I thank you. (Applause.)

CHAIRMAN LORING: Ladies and Gentlemen, we have with us tonight a gentleman who has been for many years Chairman of the Alaska Committee of the American Mining Congress, and who is now developing the coal and oil industry of the North, and who is responsible for railroad building in Alaska. Mr. Falcon Joslin. (Applause.)

MR. FALCON JOSLIN: Mr. Chairman and Gentlemen: That Alaska has not been making satisfactory progress has

been generally believed for many years. The announcement of the census figures of 1920, showing a decline of about one-third of the white population during the last ten years, simply confirms the prevailing belief. This article is an effort to point out some causes of the trouble and to suggest some possible remedies.

Clearly, if Alaska is as rich in natural recources as it is supposed to be, the population should be growing instead of declining. Indeed, by all the rules Alaska should be booming, for a fifty million dollar trunk line railroad has been under construction there for the past six years and will shortly be completed. Everywhere else in the world, from Siberia to Africa, the construction of trunk line railroads has been accompanied by rapid development.

Yet so little has this influence been felt in Alaska that the town of Seward, the ocean terminus of the Government Railroad, gained in population from 534 in 1910 to only 652 in 1920, while Fairbanks, the interior terminal, showed an actual decline in population from 3,541 in 1910 to 1,159 in 1920.

The territory as a whole showed a decline in population from 64,356 in 1910 to 54,933 in 1920, and the decline is undoubtedly continuing. When the railroad is finished and the three or four thousand men employed in its construction are let out, there will be a still further loss in population. The situation is serious. Some action is necessary if depopulation of the territory is to be stopped.

Apparently, railroad building under Government ownership with conservation of natural resources has not only failed to attract additional population but has failed to hold the population already there.

Of course, there has been a heavy decline in business in the United States by reason of the world-wide depression, but there has not been a loss of fifteen per cent of the total population. If the nation had lost 15,000,000 people and was still losing, in addition to the decline in business, there would be a condition parallel to what is taking place in Alaska.

It is true the exhaustion of the Bonanza Placer Mines at Fairbanks, Nome, and other places caused some loss of population in those places, but this is no reason for the loss by the territory as a whole. Those who had been engaged in working the

Bonanzas might have turned to other industries or continued to operate mines of lower grade as they did in other states and territories.

Gold was discovered in California in 1849. In about ten years the richest placers were exhausted, but the state did not lose population. Gold mining continued as one of the principal industries of the state and still continues so to this day, more than seventy years after the first discovery. Far more gold was produced after than during the bonanza days. Neither did the exhaustion of the rich placers in Idaho, Montana and other states result in a loss of population. Every decade showed a gain in each state. The gold-bearing areas of Alaska probably exceed that of all these states together.

It is alleged that high costs and inadequate transportation is the reason for the decline in Alaska. This, if true, might be a reason why people do not go out there but does not explain why those already there are coming away.

As a matter of fact, the cost of transportation to and from Alaska is probably cheaper than that to any other place in the world of equal distance and population. The white population is not more than 30,000. If these all lived in one place, it would only be a fair-sized town. Actually they are scattered in a dozen little towns and settlements for more than a thousand miles, chiefly along the southerly coast.

Notwithstanding this small and scattered population, there are three regular steamship lines operating there. Two are American and one a Canadian line, together they have about thirty vessels. There are about twice as many private or irregular vessels in the Alaska trade.

The passenger rates from Seattle to the coast districts is only about 3½ cents per mile, *including meals and berths.*

The freight rate on general merchandise from Seattle to Seward, a distance of 1,866 miles as the steamer goes, is only sixty to seventy-five cents per 100 pounds.

Both freight and passenger rates by water from Seattle to California ports by regular lines for similar distances are much higher than the Alaska rates, although California has a hundred times the population of Alaska. Railroad rates from any direction into Seattle are not far from double the Alaska rates, counting the cost of meals and berths. The passenger rate on the

Government's own railroad in Alaska is six cents per mile, and of course, does not include meals and berths.

Moreover, cost and difficulties do not stop immigration. The greatest rush of population to Alaska took place during the Klondike and Nome excitement when there were no regular steamship lines and the cost and difficulties of travel were much greater than now. Thousands of the early settlers in California, Oregon and Washington came overland—two thousand miles or more with ox teams or afoot. At a still earlier day multitudes of our ancestors crossed the Atlantic to the Eastern shores of America, packed for weeks and often months in sailing ships, with the dread of meeting hostile savages upon their arrival.

Some other cause must be found to account for the decline in Alaska.

In seeking for the real cause one cannot escape the conclusion that it is not lack of resources but misgovernment and bad policies in handling those resources. Too much governmental control of industries and a system of leasehold or permit titles instead of freeholds. Nothing is clearer than that the form of government of a country has much to do with its prosperity. This is especially true in Alaska where the government is both sovereign and proprietor. More than ninety-eight per cent of the land there belongs to the government and not to individuals. Of course, the terms and conditions on which this land is offered for sale or for use controls the development of the territory.

For many years after Alaska was bought from Russia it had no government at all. What it has now is almost or quite as bad, except that there are courts and peace officers and the criminal laws are enforced. No other state or territory ever had a government like that of Alaska.

Congress created a legislature for the Territory some years ago, but prohibits it from legislating on most subjects of any real importance. It is a legislature almost without power. At the same time Congress continues to legislate on all subjects great or small which really affect the welfare of the Territory.

We thus have two legislatures, one sitting in Washington and acting upon hearsay and reports; the other sitting in Juneau composed of citizens of the Territory, familiar with its problems and needs, but without power to remedy them. A committee from Congress visited Alaska about fifteen years ago and much

good resulted from its trip, but there have been no visits since.

The Alaska legislature, however, has power to impose taxes which are collected and disbursed through the Territorial Treasurer. Congress also levies taxes on Alaska for local purposes, which are collected and disbursed by the United States Treasurer. In addition there are the general federal internal revenue and income taxes. We thus have three systems of taxation with two treasuries to collect and disburse them.

The administration of the territory is even more absurd. It is administered not in Alaska, but from Washington, four thousand miles and more away.

The administration is not centered in one department and in one bureau, as it is for the Philippines and Porto Rico, but it is distributed through all ten of the departments and divided among more than thirty boards, commissions and bureaus.

Moreover, the Legislature of Alaska has established a number of boards and bureaus within the Territory often dealing with the same subjects as the bureaus at Washington. All these act independently of each other and without co-ordination, and often in conflict.

If the United States should purchase the Island of Iceland and establish a government for it, not in Iceland but in California, it would be similar to what is done for Alaska, a government that is not only beyond the seas, but across the continent also. Moreover, if it provided for two legislatures, one to sit in Iceland and the other in California, with ten administrative departments and thirty or forty bureaus, part in California and part in Iceland, we would have a legislative and administrative system similar to what we have now in Alaska.

Naturally, this form of government is sufficient to devastate a province. It is certainly returning the Territory to the bears.

One of its most incredible acts was the destruction of the coal and oil industries in the Territory. At first there was no law in Alaska whereby coal and oil lands could be acquired. Then the statutes for the location and purchase of these lands in effect in the western states were extended to Alaska. Under these statutes large quantities of both coal and oil lands were located and development was well started. Many coal mines were being opened and oil wells drilled. Then came the withdrawal orders in 1906 and totally destroyed these industries. A more

deadly way to hurt the Territory could hardly have been conceived.

These orders were prepared in Washington and signed by the President of the United States. They were originated in the Bureau of Forestry in the name of conservation, and were issued without notice or discussion by the people of Alaska. In effect they suspended the law for the sale of coal and oil lands, and were followed by rulings which cancelled virtually all titles which had theretofore been initiated. Hundreds of thousands of dollars invested were wiped out and the owners bankrupted. Moreover, more than two hundred applicants, including many prominent citizens who had located, improved and purchased coal lands, were indicted on criminal charges for no other offense than that they had bought and paid for land at the price at which it was offered and proposed to group their claims for economical working in the same manner it had been done in the West for years. Some were brought to trial but all were acquitted. No redress for their wrongs was ever offered them or even any compensation paid for their property lost or destroyed. Moreover, when the coal leasing law was passed, a section, No. 13, was inserted expressly designed and intended to deprive these pioneers of the right to appeal to the courts for redress. They were denied the right to their day in court, which is not denied even to murderers.

About the time the withdrawal orders were made for Alaska we tried to buy Panama from Colombia. Being unable to buy it, we "took" it. After many years we have recently appropriated twenty-five millions of dollars to "pay" Colombia for what we did.

The effect of these orders was to prohibit the production of coal or oil in the Territory for ten years and more.

During the same ten years the Territory imported more than $30,000,000's worth of coal and oil.

There are millions of acres of both coal and oil lands in the Territory. If titles to enough had been granted to supply the Territory's own fuel the injury would not have been so great, but it was all withdrawn or locked up. A great export business in coal and oil might have been built up. Thirty million dollars spent within the Territory instead of being sent outside, would have afforded employment directly to a considerable population.

Obviously, it would have had a stimulating effect on all other industries. But for these conservation orders the census figures for 1920 would have, no doubt, shown a different result.

The Executive having thus abrogated the law for the sale of the coal and oil lands, invited Congress to pass a law for leasing them. In effect Congress was told that if it did not pass the leasing law there would be no law at all. The withdrawal orders themselves expressly stated that they were issued to aid legislation!

In spite of this very effective aid, it took Congress eight years to pass a coal-leasing law and ten years to pass an oil-leasing law. In the meantime there was no law at all. The coal-leasing law was passed in 1914 and has been in effect now more than seven years, but there are no commercially successful coal mines in the Territory, and coal is still being imported. A cargo of coal from China was recently delivered in the Territory, and Australian coal is now being sold in Seattle and other markets that might have been supplied from Alaska.

The oil-leasing law was passed in 1920 and has been in effect nearly two years, but no drilling has taken place under it. The Territory is using now about six hundred thousand barrels of oil per year, all imported except about ten thousand barrels which are produced on one single oil claim which was patented before the withdrawal orders. Many thousands of acres of oil lands have been located under the leasing act, but capital is slow in going into the business. What happened to those who started the industry years ago is not encouraging. Indeed, it is not certain but that the arbitrary way in which the law for the sale of the coal and oil land was abrogated and Congress bullied into passing the leasing law did not do more harm than the loss of the coal and oil itself.

The territory has been able to import its fuel, but the outrage upon its laws cannot be easily forgotten. Faith in the laws and confidence in the Government was shaken.

The objection to the leasing law is not so much the high prices demanded for the lands as it is the complete power and control reserved over their operation.

The prices, however, are exorbitant. Coal and oil lands in a remote frontier like Alaska are worth nothing except after capital is spent upon them. They have a potential value but no

actual value. Their price should be only nominal. It would be good policy to give away a limited area on condition that a producing mine or well should first be opened upon it. This in effect was the public land policy in the Western States which produced their marvellous development.

Under the old law the price of coal land was $10.00 per acre. This was a good stiff price, for there is much privately owned coal land in the United States than can be bought for less.

Under the leasing law the rents and royalties on a piece of land containing a six-foot seam of coal is estimated at $300.00 per acre. In addition to this the Government reserves the right to take practically all increase in value there may be and also reserves the right to take all the buildings, tunnels and similar improvements placed on the property at the end of the lease. Moreover, it reserves the right to direct the daily operation of the mine and to determine what prices may be charged for the coal produced. The coal lease contains more than twenty pages of conditions and covenants, the violation of any of them, even the most trivial, being ground for forfeiture.

The oil law is equally restrictive and in addition some of its provisions are wholly unintelligible.

These laws do not unlock Alaska's resources—they only bar them the more securely. A year or more ago the oil companies of California gave notice that after a certain date they could supply no more fuel oil to Alaska. Fortunately this disaster was averted by discovery of new oil districts, but it may be renewed again at any time. It is possible that under the stress of necessity there may be some coal and oil produced under the leasing laws, but it seems reasonably certain that there will be no general development. Ten years more of experimenting, however, may be necessary to prove this.

There are fine forests along the south coast accessible to good harbors. There are also many excellent water powers within these forests, making them almost ideal for wood pulp and paper making. But this industry is undeveloped for no other reason than that no satisfactory titles can be had. The government through its Forestry Bureau insists on such terms and on such control that capital will not go into the business.

There are estimated to be a hundred thousand square miles of agricultural land in Alaska, much of it highly productive.

Fifty bushels of oats and 300 bushels of potatoes to the acre are common. The first law allowed homesteads of 320 acres to be taken up. This was then changed to 80 acres and then changed again to 160 acres. But lest some plutocratic farmer should monopolize the water front, every alternate 80 rods along each side of all navigable streams was reserved from settlement. Any stream up which a salmon could swim was held to be navigable! This made every creek navigable, for the salmon struggle up streams that one may step across.

These 80-rod reservations extended back for a mile, and as the streams wind about it became perplexing for settlers to tell whether he was a trespasser or not. The general attitude of the government was to regard any one seeking to acquire government land as a criminal, instead of a benefactor. This absurd reservation has recently been modified but not repealed.

One of the most unfortunate effects of this long range and complicated government is the threatened destruction of the great salmon industry. The output of salmon has reached as high as sixty million dollars per year, but is now declining and will no doubt be entirely destroyed in a very short time unless some vigorous and intelligent action is taken. There is no reason why this splendid resource should not be maintained forever except inefficient government.

Innumerable other instances of wretched misgovernment could be cited, but it would be tedious. Its sins of commission have destroyed some industries and its omissions others. Unless there can be a radical change in the form of government there seems no hope for the Territory. It is this feeling that is causing the loss of population.

Various measures have been proposed to remedy the situation. The Curry bill now pending proposes to establish a development board in Alaska and transfer the administration from Washington to Juneau. The board as proposed, however, would not be properly subordinated to other authority and therefore would not be a responsible executive body. The Cummins bill proposes to authorize the President to consolidate the bureaus in Washington or redistribute their functions. The New bill proposes to consolidate the bureaus in Washington in the Interior Department. All of these measures propose to consolidate the bureaus, which is certainly desirable, but is only one step in the

right direction. It may be, however, all that can be attained at present.

It seems just as essential to place the administration in Alaska as it is to consolidate it in one department. But no administration, whether consolidated in Washington or in Alaska, can make unworkable laws work, or induce the owners of capital to invest in an enterprise which would immediately come under some other control than their own. Some machinery to revise the laws is just as necessary as to revise the administration.

It seems hopeless to expect any satisfactory legislation from Congress. It is too far away and too unfamiliar with conditions there, and it is impossible to get the truth about the country from irresponsible or interested witnesses. Moreover, every political fad that sweeps the country and passes on with little effect on the nation is tried with crushing effect on Alaska. Trust-busting, conservation, the leasing system for public lands, and Governmental regulation and control of industry, have each in turn been applied with full force to the infant industries of the Territory. The efforts of Congress, made with the best intentions in the world, often make the laws worse instead of better and the Territory is advancing backward instead of forward. It is safe to say that satisfactory laws for a country can never be made except by those who reside in the country and are personally familiar with its conditions and needs. There is not a doubt but that if the lands and resources of the Territory were offered for sale and for use on the same terms and conditions on which those in the Western States were offered, a booming growth would start immediately and continue indefinitely. The taxes the Government could collect for the increased value and income of property in the Territory would probably far exceed the receipts from the rackrents and royalties under the leasing system.

In 1916 Congress passed a new organic act for the Philippines. The act contains a complete set of laws for the disposition of the mineral coal and oil lands in the public domain of the islands. Although Congress had the Alaska leasing laws before it at the time, it did not apply them to the Philippines but re-enacted the laws on these subjects as they had been in effect in the Western States for so many years. A few, but very few, modifications and improvements were made to them. The Philippines legislature was also authorized to legislate for the disposition of the

agricultural and timber lands. The act also contains the following clause:

"That all public lands except such as may have been heretofore sold and disposed of in accordance with the provisions of the act of Congress of July 1, 1902, shall be placed under the control of the government of said islands to be administered and disposed of for the benefit of the inhabitants thereof, and the Philippine Legislature shall have the power to legislate with respect to all such matters as it may deem advisable, but the acts of the Philippine Legislature with reference to land of the public domain, timber, and mining, hereafter enacted, shall not have the force of law until approved by the President of the United States."

The Bureau of Insular Affairs no doubt managed this legislation in Congress, while the Bureau of Forestry was responsible for the Alaska leasing legislation. The Insular Bureau apparently preferred to adopt a law that had been tried and proved successful rather than to experiment with a new and untried leasing system.

To simplify and coordinate the government of Alaska, it would only be necessary to follow the principle of the acts of Congress establishing governments for the Philippines, Hawaii and Porto Rico. The State of Illinois and the State of Washington also have each recently reorganized their governments and consolidated their numerous bureaus along the same lines. A very few changes would adapt the system of government in effect in the Islands to Alaska. This is especially so as to the Porto Rico act which was passed in 1917, and is therefore the latest expression of Congress as to the proper form of a territorial government.

Briefly, this act provides that there shall be a governor appointed by the President and confirmed by the Senate as the Governor of Alaska is now. The Governor is subject to removal by the President at any time. There are about six departments, the heads of which would be appointed by the Governor and confirmed by the local Senate. They would be appointed for a term of four years subject to removal by the Governor. In Alaska these department heads might be as follows:

Commissioner of Public Lands
Commissioner of Public Works
Commissioner of Fisheries
Commissioner of Education and Health
Attorney General Secretary-Treasurer

To these departments the duties now exercised by the various Bureaus and Commissions both at Washington and in Alaska would be transferred.

These heads of departments sitting together with the Governor would constitute an Executive Council or local cabinet. This organization is very similar to that of the National Government itself.

In the Philippines act it is provided that the heads of departments have the right to be heard and the duty to answer questions in either house of the Legislature. It is also provided that the Legislature shall not create any new department or any bureau or board except subordinate to one of the established departments.

The Act provides that the President shall designate some one department at Washington to which the local government shall report. The Philippine and Porto Rican governments report to the War Department in which the Bureau of Insular Affairs was created for that purpose. No doubt the Alaska government would be directed to report to the Interior Department which is most familiar with its affairs.

For the Islands the President also appoints and may remove at will an auditor who was authority similar to the auditor for the United States.

If a government for Alaska could be established along these lines it would provide a responsible system of administration within the territory, but subject always to full control by the President and Congress. It would give the Governor some power and authority and enable him to be of real service to the territory.

The legislature in the Islands is given very wide powers, but safeguarded in the following manner: It may legislate upon any appropriate subject and may modify, amend or repeal any existing statute affecting the territory, but all legislation affecting the Public lands must be first approved by the President before it can take effect. The Alaska legislature assisted by the heads of departments and the Governor would be the agency for drafting laws in Alaska.

Congress also reserves full power to repeal or annul any acts of the local legislature as it may see fit.

This system would free Congress from the burden of legislat-

ing on details of local government and would place the law making power as well as the administration within the territory instead of at Washington.

Norway, Sweden and Finland lie in the same latitudes and have the same climate as Alaska, but have only 441,000 square miles to Alaska's 586,000. They have similar resources and a population of more than ten million people. The resources of these countries are agriculture, fishing, timber, iron mining and reindeer. Alaska has all these except iron, and in addition has gold and copper, coal and oil which the Scandinavian countries have not.

There is every reason to believe that with a suitable government, Alaska would support a population at least as great as these countries.

CHAIRMAN LORING: We have an important communication from Washington and I will ask the secretary to read it to you.

SECRETARY CALLBREATH: The communication is from Senator Oddie of Nevada. May I preface in a three-minue statement of what this leads up to? You have all heard something of what is known as the McFadden bill, an effort on the part of our organization to induce Congress to pass a law by which those who use gold for other than monetary purposes might be forced to pay the cost of its production today. That is the McFadden bill. We found that in 1915 this country had produced $101,000,000 and last year it produced $49,500,000, a falling off of more than 50 per cent of the gold production, because of the fact that while the value of gold is fixed by the government and it remains stationary, the value and cost of operation had almost doubled so that effective gold mining had stopped. We believe that if under those conditions, while the burden upon gold of an increased currency was growing, it was wise that we should undertake to see to it that the foundation upon which our credit is built, the gold in our treasury, should not be pulled out to be manufactured into luxuries and jewelry. We therefore asked that that gold which was to be manufactured for any purpose other than monetary issues should pay a tax of ten dollars an ounce, this to be offered to the gold miner in order to stimulate production in order that our gold mines should not be forced to entirely close up, as they have very nearly today.

That bill was presented to Congress and the Ways and Means Committee, after having given it careful consideration, came to

the conclusion that if the Secretary of the Treasury of the United States believed in that bill that they would approve it.

The bill was presented to the last administration and the Secretary of the Treasury disapproved. It was brought again to the attention of the present Secretary of the Treasury and he disapproved. Recently a paper which was published in the next to the last issue of the Mining Journal, signed by twenty-two United States senators, called upon the Secretary of the Treasury to reconsider his action, to look into the question of gold production, and if the McFadden bill was not the proper remedy, to offer some other remedy which would prevent the entire destruction of the gold industry of the United States and prevent that replenishing of our treasury which ought to continue to proceed if we are to continue to maintain it upon that basis.

We in this country have maintained the gold standard during all of this time. Only one other nation in the world has been able to do it, and therefore the protection of the gold standard is a matter of vast importance to all of you and I want to say to you now that I believe the gold standard in the world never was in greater danger than it is today. One nation cannot maintain a gold standard for the world. It may maintain it for itself but no nation can maintain a gold standard without gold. Today the gold of the world has come to the United States while those nations to whom we desire to sell our goods have no credit with which to buy because they have no gold upon which to base a credit. Therefore the American Mining Congress believes that some effort should be made to remedy this situation. We must sell ten per cent. of our goods in foreign markets if we keep the wheels of our industry moving. We cannot sell to people who have no money and who have no credit and the problems which revolve around this all center around gold production and therefore we do not believe it is wise for this nation to permit its gold mines to be closed, the timbers to rot and the machinery to rust and business put out of commission so that it never can be reopened. This matter, as I said, was presented to the Secretary of the Treasury a few days ago and I have no doubt you have seen the report of the Secretary of the Treasury in reply to this inquiry signed by twenty-two senators of the United States.

I have this letter from Senator Oddie:

"I regret exceedingly my inability on account of my official duties in

Washington to be present at the Conference of the American Mining Congress, as I had planned and hoped to do.

"You no doubt have already seen the reply of the Secretary of the Treasury to the resolution signed by the twenty-two western senators relative to the gold situation. Inasmuch as I cannot be present, I shall appreciate very much if you will present the reply to Secretary Mellon's letter of September 30th, copy of which I herewith enclose, to the Convention to be released for the press.

"Thanking you for according me this courtesy and trusting that the Convention will meet with its usual success, I remain

"Very Sincerely,
"TASKER L. ODDIE."

I beg to ask of you that we may have the chief of our Gold Division, Mr. Harold Lawrie, read this message to you. (Applause.)

(Mr. Lawrie then read Reply of Senator Oddie to Secretary Mellon, which will be found in Report of Gold Conference.)

MR. LAWRIE: That is the letter of Senator Oddie and my attention is called to the fact that the gold conference will be called tomorrow afternoon at the rear of the registration room at two-thirty, so that all those interested in this subject of gold should be there. This is much more of a far-reaching subject than that which pertains to those particularly interested in the industry itself, as it vitally affects the welfare of everybody in the country. We should be glad to have a large attendance at that gold conference.

Copies of this address will be available in the morning. Thank you very much.

CHAIRMAN LORING: Ladies and gentlemen, there will be an industrial film by the Bureau of Mines for those of you who will want to see it.

(The industrial film, "The Modern Goliath," was then shown, after which the meeting adjourned.)

THIRD GENERAL SESSION

WEDNESDAY MORNING, OCTOBER 19, 1921

The meeting was called to order at ten-fifteen by Chairman W. J. Loring.

CHAIRMAN LORING: Ladies and Gentlemen: The first speaker on the program today is a very prominent railway president of the United States. I have great pleasure in introducing Mr. C. H. Markham, President of the Illinois Central Railroad.

MR. MARKHAM: Mr. Chairman, ladies and gentlemen. The railroads of the United States occupy a unique relationship to other business institutions. They are the arteries through which the life-blood of the nation's business flows. In no other industry is there found the fundamental dependence of virtually every business institution upon a single one that marks the relationship between the railroads and their patrons.

The service of transportation by rail is the foundation of American business life as it is now constituted. Only a small fraction of the products of the nation's toil is consumed within a radius from the point of production which can be served adequately other than by the railroads. If Illinois mine operators were denied the service with which to market their products outside a radius which might be reached by purely local transportation facilities, their industry would be comparatively valueless. Products of the farm would be worth little if the farmers did not have the service of the railroads to ship their products into the markets of the world. The same thing is true of foresters, manufacturers, wholesale dealers—in fact, of virtually every business other than those which are purely local in their nature, and even those depend in some measure upon railway service for their continued activity. We have grown out of our swaddling clothes, industrially, in the United States by the aid of the railroads, which have furnished a service that has come to be indispensable. Were that service to be greatly impaired, the commercial structure of the country would collapse, like a building from which the foundation is torn away.

Such a relationship as the railroads have toward American business life, therefore, implies a great obligation upon the men

who are responsible for the conduct of the railroads. Being the producers of a service which is the cornerstone and the foundation of industry, it becomes the duty of railway men to regard their tasks in the light of service to the public welfare. I speak on behalf of my associates in the business of transportation when I say that we have such an ideal set before us.

The revolutionary changes which have transpired in the transportation business during the last generation have made the railroads increasingly dependent upon public opinion. The Interstate Commerce Commission, forty-eight state commissions, the federal and forty-eight state legislative bodies, and the Railroad Labor Board are constantly laying down limitations upon railway managements—ninety-nine public bodies whose duties and responsibilities are neither adequately defined nor sufficiently co-ordinated. This situation, for which the public is responsible, has created what is frequently called the "transportation tangle." It makes for a division of responsibility. Neither the Interstate Commerce Commission, any of the forty-eight state commissions, the congress, any of the forty-eight state legislatures nor the Railroad Labor Board is responsible for the railroads. Ostensibly their management is in private hands, but the private managers, under present conditions, do not have the authority and responsibility which they must have to obtain efficient service at a cost which will not be burdensome to the public.

An important witness before the hearing which the Senate Committee on Interstate Commerce conducted in Washington last May testified that 97.5% of the cost of producing transportation service in 1920 was entirely outside the control of railway managements—vested either in governmental agencies or market conditions over which the railroads have no control.

I believe the public does not adequately realize what these limitations upon railway management amount to. The railroads are not protesting against public supervision. Theirs is a public service, and it is entirely right and proper that it should be performed under the supervision of the public's agencies. But when these agencies take over the functions of the management to the extent that they control, without being responsible to the public for it, virtually the entire operating costs of the railway industry, a disastrous situation results.

The remedy for it is to place once more in the hands of railway managements—under competent and broad-minded supervision—the control of operating costs, in such a way that responsibility may properly be fixed upon the managements for the operation of their properties.

The managements of the railroads of the country are the trustees of the nation's greatest industrial investment—an investment which has been valued by the Interstate Commerce Commission for rate-making purposes at nearly $19,000,000,000. With the successful operation of the railroads dependent upon public opinion, it behooves their managements, as trustees of a great industry of such fundamental importance to the country, to be constantly on the alert to exercise their influence upon public opinion in such a way that the railway policies which the people of the country decide upon shall be to the nation's best interests. Railway men are coming to take a greater interest in what the public is saying about the railroads, casting off their old attitude of reticence and aloofness and endeavoring to meet the public on the common ground of mutual confidence and good will.

The railway situation changes with kaleidoscopic swiftness. What today looms as the most important phase of the situation may be relegated tomorrow to comparative insignificance by the development of another aspect. A year ago the railroads were being called upon to move a greater volume of traffic than they had ever moved in a like period of time. Every ounce of man power and every piece of railway equipment had to be utilized to the fullest extent in expediting traffic movement. Within a few months the business depression which came with the move toward deflation had actually made a problem for the railroads in the storage of idle equipment! This was followed by the need for the greatest possible retrenchments as railway earnings diminished with the decrease in traffic. Net earnings were cut below the vanishing point, and the railroads were driven by necessity to take drastic action in laying off men, deferring maintenance work and pinching their expenditures all along the line to make both ends meet. Some even had to break long-established dividend paying records.

During 1920 the railroads realized a net operating income equal to approximately one-third of 1 per cent upon the valua-

tion placed on railway property by the Interstate Commerce Commission—practically nothing for the payment of either interest or dividends. During the first six months of 1921, the railroads should have earned, to make a 6 per cent return upon the valuation of their properties, a net operating income of $447,256,000. They actually earned $128,912,000, a shortage of $348,344,000. Instead of 6 per cent upon their valuation—a return established by the Transportation Act as "fair and reasonable" for the present period—their net earnings for the first six months of 1921 were at the rate of only 1.8 per cent upon their valuation. There has been a perceptible improvement in the situation since the middle of the year, but, taking the first eight months of the year as a whole, net railway operating income has been at the rate of only about 2.6 per cent on the valuation of railway properties.

There is no way this shortage can be made up, for, mind you, the rate-making provision of the Transportation Act is in no sense a guaranty of earnings. If the rates fail to earn a "fair and reasonable" return, the only recourse is for the railroads to ask higher rates, which it is then the duty of the Interstate Commerce Commission to grant. The railroads have refrained from taking this step, believing it more in the interest of the public welfare to take their losses, making every reduction in expenses possible and allowing the situation to work itself out. A great deal of misconception of railway problems is based upon a misunderstanding of the rate-making provisions of the Transportation Act. Unfortunately, many persons believe the Act does constitute a guaranty to the railroads, and the term "guarantee" is frequently used in press reports and comment upon the railroad situation. There seems to be an organized effort to make the farmers, especially, believe that in some way or other the railroads are receiving earnings which constitute a 6 per cent return upon the valuation of their properties—if not directly from the rates, then from governmental funds. While such an idea is absolutely at variance with the facts in the case, it has taken root and has been the foundation of much misunderstanding and unjustified criticism.

It should be pointed out that even the almost negligible return that the railroads have obtained thus far this year—a return insufficient to pay even the interest on their outstanding

bonds—has been realized only at the cost of deferring important maintenance work which will have to be performed in the near future. Although the wage decrease which went into effect July 1 made possible the resumption of considerable maintenance work on some of the railroads, revenues have been so small in comparison with expenses that the present rate of maintenance work is still far from adequate. For example, in August of this year the railroads spent approximately $182,000,000 for maintenance purposes, which was a reduction of $151,000,000, or 45.3 per cent, as compared with expenditures for maintenance work in August, 1920. It was largely because of this reduction that the railroads were able to show a net operating income of $90,000,000 in August. If they had spent the same amount in maintenance work that they spent for that purpose in the corresponding period of 1920, they would have incurred an operating deficit in August this year of more than $60,000,000.

The country is going through a period of great readjustment. The railroads have been taking their share of the losses, in spite of the fact that during the years of prosperity, when other industries were permitted to lay by earnings to prepare them against such a period of depression, when farm products soared and wage costs mounted to new levels, the railroads were not permitted to profit in the same degree. Instead, their earnings were limited under governmental operation to the average net return of pre-war years, and since governmental operation their earnings have declined progressively.

The country demands adequate transportation. The railroads are responsible for providing it. Their managements would be derelict to duty if they failed to exert their utmost efforts to provide it, or if they adopted, even in response to the demands from the public, a course which would result in impairing the efficiency or adequacy of transportation service. Because of the limitations upon their earnings and upon their initiative by the Interstate Commerce Commission, the forty-eight state commissions, the Congress, the forty-eight state legislatures and the Railroad Labor Board, the managements are not able to respond to every demand for readjustment.

There has been an insistent demand for a reduction in rates to correspond with the general trend of liquidation. However, while transportation charges admittedly are high, the costs of

virtually everything which goes into the production of transportation service are still relatively much higher than the general scale of rates. The average increase in freight rates since 1916 has been 74 per cent and in passenger rates 53 per cent, including the surcharge on sleeping car fares. Compare these with the pre-war costs of labor, fuel, materials, taxes and interest rates paid by the railroads.

After the 12 per cent wage cut July 1, the average annual compensation of railway employes is $1,695, as compared with $815 in 1914, an increase of 108 per cent. Road locomotives which cost $21,485 in 1914 now cost $48,000, an increase of 123 per cent. Switch engines which cost $14,511 in 1914 now cost $35,500, an increase of 144 per cent. Gondola cars which cost $824 in 1914 now cost $1,990, an increase of 142 per cent. Refrigerator cars which cost $1,323 in 1914 now cost $2,950, an increase of 123 per cent. Box cars which cost $859 in 1914 now cost $1,910, an increase of 122 per cent. Steel passenger coaches which cost $13,827 in 1914 now cost $27,654, an increase of 100 per cent. Locomotive fuel which cost $1.70 a ton in 1915 now costs $4.07 a ton, an increase of 139 per cent. Interest rates have increased greatly. The Illinois Central System sold bonds in 1914 on a basis yielding less than 5 per cent to purchasers, and it recently sold a large issue of bonds which yield more than 7 per cent to purchasers. The direct taxes paid by the railroads in 1911, taking a ten-year period here for comparison, were $98,628,848, and last year they were $278,868,668, an increase of 183 per cent. In addition to that, users of transportation paid a war tax of $232,809,963.16 in 1920, which the railroads collected as agents of the government and turned over to the government. This entire amount represents an increase over 1914, when no such tax existed.

Labor costs are principally responsible for the present rates charged for transportation service. Prior to 1917 the labor costs of the railroads had not exceeded $1,500,000,000 annually. In 1920 the labor costs of the railroads of the country were more than $3,500,000,000. In 1916, 40 cents of the railroads' revenue dollar went to pay labor costs. In 1920 it took more than 60 cents of the revenue dollar to pay labor costs. Even at the present time, with the reductions which were made July 1, labor costs are running at the rate of about 60 per cent of all railway income.

With a consciousness of their obligations to the public service, the managements of the railroads of the country have recently announced that they will ask the Railroad Labor Board for a further reduction in wages, the entire benefit of which they propose to pass along to the public in reduced freight rates. This puts the situation up to the public, which exercises the balance of control on the Railroad Labor Board. If the public wants reduced rates, its representatives on the Labor Board have the opportunity to secure them by granting such wage reductions as will make reduced rates possible. The basic principles of rate-making is the establishment of a rate level which will permit earnings to meet the cost of operation under efficient, honest and economical management, with a fair and reasonable return upon the valuation of the properties engaged in the railway service. This principle is adopted as a public policy in the Transportation Act.

The proposed reduction is in line with the policy which has been followed by the railroads since their return from federal control. Since the general rate increase of August 26, 1920, the railroads have made many reductions in individual commodity rates. These reductions have amounted to large savings by shippers. They were made voluntarily. At no time since August 26, 1920, have the roads been bound, under the law, to make reductions, for at no time have their earnings justified such action. The present rate level was attained through a series of blanket increases. These increases resulted in many inequalities, and since then economic readjustments have taken place and further inequalities have manifested themselves, especially in the agricultural field, where the greatest liquidation has transpired. The railroads have been attempting to meet the demands for readjustments of rates, but they have been limited by the control which public agencies hold over wages, working conditions, etc.

The cuts in wages which the managements propose that the Railroad Labor Board shall authorize are these: That the wages of train service employes be reduced sufficiently to remove the remainder of the increase granted by the Labor Board's decision of July 20, 1920 (which would involve a further reduction in the wages of this class of labor of approximately 10 per cent), and a reduction of the wages of all other classes of labor to correspond with the wages being paid for similar work in the terri-

tories in which the railroads operate. Unskilled labor costs the railroads of the country last year more than $1,300,000,000. Other industries have been liquidating labor costs, especially the wages of unskilled labor. It is utterly unfair that the farmer, for instance, should have to pay freight rates sufficient to make it possible for the railroads to employ labor at three or four times the price which he is paying for exactly the same kind of labor.

Frankly, I wish it were possible to maintain the present scale of wages on the railroads of the country, and particularly on the railway system over which I have the honor to preside. I have a great sympathy for the man who works and who is struggling to better his own position in life, and I would favor paying those who are doing honest and conscientious work for the welfare of their employers the limit justified by economic conditions. To go beyond that limit would be equally inimical to the workers and the general public.

It is in the interest of the public welfare that the men who operate the transportation systems of this country—so vital and indispensable to the public—should be dealt with fairly and paid reasonably well for their services, but it is not in the interest of those men themselves to exact more than that, or to bring about a condition that would permit them to profit at the expense of other groups.

The extent to which the railroads will ask the Labor Board to reduce wages is not excessive. The railroads need the support of the public to bring about this liquidation. Upon whether the public responds will depend the issue of reduced freight rates.

It is most important that the public understand clearly the issue involved in the order for a general railway strike which has been formulated by the railway labor brotherhoods. The thing it is proposed to strike against is the decision of the Railroad Labor Board authorizing a reduction of approximately 12 per cent in wages, which the railroads put into effect July 1. There is at present no other possible grounds for a strike.

The situation, in important respects, is more serious than that created by the strike order issued by the labor organizations in 1916, which precipitated the passage of the Adamson Act. At that time, while the railroads had asked for arbitration, there

had not been any arbitration because the labor unions had refused it. Therefore, the labor unions were technically within the law. The present case is entirely different. The Transportation Act of 1920, a law of the United States, created the Railroad Labor Board. The act requires the railroads and their employes to submit to the Railroad Labor Board disputes over wages and working conditions which might interrupt the flow of transportation.

Demands for advances in wages made by the railway employes last year were submitted to the Railroad Labor Board, and in July, 1920, it granted them advances averaging about 22 per cent, retroactive to May 1. The railroads, in accordance with the law, put these advances in wages into effect.

This year the railroads applied to the Labor Board to cancel this entire advance in wages, and the Board authorized a reduction, effective July 1, of only about 12 per cent, or approximately half of the July, 1920, increase. While the railroads complied with the decision last year for a retroactive advance in wages, the labor brotherhoods propose now to defy the law and strike, rather than accept a reduction in wages substantially less than the increase last year. The course of the labor unions in ordering a strike is in violation of the decision of the Railroad Labor Board. It is a strike against the lawful act of a governmental body. The main object of the labor provisions of the law is to prevent an interruption of the vital service of transportation. If strikes occur regardless of them, these provisions will be rendered void.

The issue is one of vital concern to the public. Railway managements are not trying to escape their responsibilities in calling attention to that fact. We are conscious of our obligations to the public, and we shall make every effort to fulfill those obligations. Should the threatened strike take place, we shall do our utmost to move necessities, utilizing to the fullest possible extent all the man power available.

CHAIRMAN LORING: The next speaker on the program will deal with "Some Items in a Prosperity Program." Mr. George Otis Smith, Director of the United States Geological Survey.

MR. SMITH: Mr. Chairman, Ladies and Gentlemen: Our slogan, "The mining industry is fundamental to national prosper-

ity," is more than self-praise; it is a challenge to ourselves. If the products of the mines are essential to human progress, it is up to us to keep the mines running so as to contribute our share to the Nation's prosperity. What, then, are our items in a prosperity program?

The possession of raw materials is, of course, the starting point for a great nation, and the opening item in a program of prosperity is an assured supply of stuff with which to work. How large an item the mineral raw materials together make up can be better grasped if I tell you that last year the output of our mines and quarries would have loaded every freight car in commission in the United States thirteen times over, and that the oil from our wells was enough to fill every tank car seventeen times.

You men who lead in the creation and operation of great mines and smelters and furnaces have doubtless gone furthest in visualizing the mining industry as almost the largest unit in the Nation's business. But do you see, and does the less thoughtful public see, far enough in this matter of providing for prosperity not in terms of your own companies but in terms of the whole of your branch of industry and of all other business connected in any way with your particular undertaking—in short, is your vision and is my vision country-wide in its scope and national in its direction?

Less than twelve hours before his assassination President Lincoln said of the miners of the West, "Their prosperity is the prosperity of the Nation." His words were prophetic, as was also his statement that the mining development of the United States had scarcely begun. In the four decades during which the United States Geological Survey has recorded the progress of the mining industry the output of minerals has increased nearly seventeen-fold if measured by dollars or nearly ten-fold if weighed in tons. You will note that this means your mineral product has about doubled in value every decade, but the better measure to express your real contribution to the Nation's prosperity is the ten-fold increase in tonnage. To the consumer of your product the tons you mine and deliver are what count, although the dollars he pays mean more to you. In terms of industry and of prosperity, quantity is the truer gage of usefulness; the totals stated in dollars may not signify the advances they seem to show.

I have thus tried to appraise your share in the Nation's prosperity, to present the national aspect of mining, but let me add that the only nationalization we need is this looking upon American industry as a national unit. Our great productive business permeates the whole body politic and is too intimately related to the common welfare to be regarded simply as a chance collection of independent units unconected and unco-ordinated. The war demonstrated the dependence of one industry upon another and the Nation's dependence upon all industry—are we to forget that this is as true in normal times as in the hour of emergency?

This dependence of the country upon its mineral resources makes it necessary to take two kinds of inventories: the current count of stocks on hand—of the amount of coal or metal at the mines, on the rails, and in the bins or storehouses of the consumers—and then that for less tangible measuring of the ore reserves deep underground, gaging undrained oil pools, and weighing of coal beds still untouched. Both inventories are absolutely essential to the conduct of a nation's business, however difficult they may be to take or however imperfect they may be after they are taken, for the larger our business the more important it is to reduce the hazards—to take the guess out of our planning.

To reach the practical man, increased emphasis must be put on the usefulness of statistics for forecasting the future. Coal operator and coal consumer alike should know how much coal the country needs for the coming winter, how much coal there is in the country's coal bin, and how much the mines were producing last week. In any emergency such figures as these are what we need in our planning, that we may keep the wheels turning. So, too, up-to-date statistics of metal production and consumption are equally desirable if we are to do business with a minimum of risk. Producer and consumer can profitably cooperate in compiling the figures that express the facts, and indeed they must co-operate if the truth is to be made available. It would, for example, be telling only part of the story to publish figures showing the stocks of copper or zinc held at the smelters or refineries if the facts as to the supplies of the same metals held by the brass manufacturers are kept as trade secrets. Business prosperity in this great industrial commonwealth will be attained only through what has been finely termed a greater

"transparency of industry." To put the case as plainly as one of the leaders in the metal industry did, each operator on a large scale must know what his competitors are doing, and the only fair way to know that is to tell what he himself is doing. In that spirit we can carry on our business with less risk and more profit.

The making of estimates of unmined reserves is no less essential part of national planning than the periodic stock-taking of material on hand. The rapid increase in per capita consumpton of coal and oil and copper and iron—indeed, of almost every mineral commodity — is warning enough that even though America is rich beyond compare, you builders and operators of modern industry can not afford to be spendthrifts. We can determine both private and public policy more safely if we keep our eyes open to the facts of future supply. It matters not whether the Government estimate of nearly 50 per cent exhaustion of our domestic supply of oil is absolutely accurate or only a rather rough approximation to the truth; the lesson taught by the best figures available is that the United States needs to watch its step. So, too, in the matter of our coal supply, even with 99 per cent unmined, we already face the certainty, for our future output, of decreasing quality and increasing cost. And so also with the metals, the future security of American industry depends upon our keeping before us the best available estimates of what is left in the Nation's vast storehouse. The geologist must continue to measure the unseen and weigh the undeveloped, while his brother engineers improve mining and metallurgical methods to the end that even larger recoveries of the earth's resources are made each year, so that every inventory must be subject to constant correction; yet for the purpose of guiding future operations, it is far better to use these approximations than to go it blind, with an optimistic faith that the Lord will provide for the future of the United States. The teaching of modern geology is that optimism will add nothing to the supply of coal or ore or oil actually remaining underground.

Next to raw materials in an industrial program must be placed the item of energy. In the days when we were speeding up every industry that helped to supply our armies at the front we learned to measure closely our productive strength in terms of man-power, and everywhere and anywhere that a man could be saved from unessential work it meant one more man-power

added to the strength of the Nation. In these days of unemployment the value of each unit of human energy may be a less obvious but a no less real item to be reckoned with in the national economics. Prosperity and waste of human energy can not be easily reconciled.

The modern industrial system, especially here in the United States, is founded on multiplying man-power with machinery—on lightening the load of labor by means of electrically driven tools and machines, which must be thought of as not so much labor-saving as product-increasing agencies. There is no other route to prosperity so direct as this method of increasing the productivity of American labor through a larger equipment of mechanical power. The wider use of improved machines is the surest way to continue American standards of wages and living, against all competition in the world markets.

The third item in a prosperity program that I would suggest is full-time operation. Unemployment means a nation-wide tax that directly or indirectly affects every citizen, rich or poor, busy or idle, for unemployment involves the tax of idle plants and idle cars and idle men, and that tax must be assessed against the whole public. Continuous employment or full-time operation is an industrial ideal to be sought by both capital and labor.

Not to go far afield for an example of the bad economics of part-time operation, let us glance at the coal situation here in Illinois. During the present year the mines in this State may produce about 70 million tons, as contrasted with, say, 75 million tons for an average year, or 90 million tons last year. Now, on the best authority 125 million tons is the capacity of the Illinois coal mines, which you see is 40 per cent in excess of the peak and 60 per cent in excess of the average output. Such an excessive mine capacity represents wasted capital and wasted labor and explains why the average working year of the average mine-worker in this State is only 192 days. This means that part-time employment is a State-wide habit in Illinois, whose coal output is so essential to the industrial and domestic consumers over 18 States.

Our soft-coal business has perhaps become the classic example of irregular employment, for the average bituminous mine in the United States can expect to run only about 215 days in the year. If we knew as much about some other basic industries we might find similar enforced idleness of man and machine.

For example, Secretary Hoover's Committee on Elimination of Waste in Industry reports that in the men's ready-made clothing business "seasonal irregularity alone counts for nine wasted hours in every working week."

In fact, so common is part-time operation that we are too prone to pass it up as a necessary evil—that is, as a part of the natural order of things. But the wastes in the mining industry due to irregular employment should rather be regarded as a series of leaks that must first be laid bare and then stopped—such leaks as the unproductive hours of the worker, the higher daily wage that must go with the short year, and the fixed charges and depreciation not only on idle mine plants but on idle cars and other railroad equipment. No accountant can add up the total waste through such a line of leaks, but Mr. Eugene McAuliffe's bold attempt gave him reason to believe that the annual cost to the Nation is not less than $500,000,000.

Chief among Mr. McAuliffe's items is undoubtedly the high wage rate necessary to compensate the miners for seasonal irregularities of unemployment; but forget for the moment that big item and look at the more readily analyzed item of overhead costs, piled up as so much waste where part-time operation is the rule. Three of the Fuel Administration engineers, Messrs. Garnsey, Norris, and Allport, found a definite relation between decreases in operating time and increases in cost. Selecting one factor of nonoperation—car shortage—as a subject for analysis, they found that when car supply was 40 per cent below normal costs were 29 per cent above normal, and so on. In other words, if normal costs were $2 a ton, a 40 per cent decrease in car supply meant an increase in costs of 58 cents a ton. Of course when the engineers made that statement they were generalizing, but any operator can think of illustrations to support the generalization. A prominent Illinois operator has testified that his costs vary as much as 60 cents a ton from one month to another, for no other reason than a change in the tonnage produced, and the same thing holds true for entire fields.

To prove how big this leak is we have only to consult the Federal Trade Commission's record during the war. Field after fields shows a difference of 20 cents, 40 cents, 60 cents, or even 90 cents a ton between the average costs in the lowest-cost month and in the highest-cost month. In this period (December 1917-December 1918) the wage scale was constant, and the chief

cause of the variation in cost was the variation in tonnage of coal mined. For example, 13 operators in southern Illinois produced during June at the rate of 47,800 tons a day at an average cost of $1.88 a ton. In December of the same year the same operators were producing at the rate of only 32,700 tons a day at a cost of $2.31 a ton. The difference between the costs in the months of highest and lowest production was thus 43 cents.

This part-time operation of our bituminous mines is not only costly, but it is avoidable. That we lose on the average 93 out of 308 working days in the year is not the whole story—the mines were idle on the average 113 days in 1919, 86 days in 1920, and this year the enforced idleness will amount to at least 123 days. Such is the record of lost time—of actual waste but not unavoidable waste. Our own anthracite mines do not sustain such losses as these, and the soft coal mines of none of our principal foreign competitors sustain such losses. For example, in the last year before the World War the mines of France and England worked 290 days, those of Belgium worked 298 days, and in Prussia and Austria the number of days actually worked was greater than our theoretical full time. Such figures are even more remarkable because for many countries they represent the average number of days of labor by each employee, whereas our figures and those of Great Britain represent days of mine operation.

This steadier operation of the coal mines in the European countries is not only a blessing to the miners but a commercial advantage to those countries. As you face the struggle for the world's export trade, look at the balance sheet of the United States. Nature has given us wonderful beds of high-grade coal than can be easily mined; the productivity of the American miner backed as he is by machinery, is far above that of the European miner. In transportation, however, both Nature and man are less kind to our coal; our fields are distant from the coast, our merchant marine is new and untried, the balance of cargoes is against us, and freight costs are therefore high.

Those bonanza months of last year when coal sold at Hampton Roads for $25 a ton could not last. Our coal then moved to distant lands regardless of freight rates; now the currents of the foreign coal trade are shifted by differences in cents, not in dollars; freights and salesmanship again control foreign

markets. In a word, we shall have difficulty in retaining any of our newly won commerce, and every advantage, however small, is sure to count.

So it is that prosperity in the coal industry can not be attained without a longer working year, for with our excess mine capacity we need an export trade in coal, and we must meet competition in the world's markets. In England the miners work nearly full time—except when they strike. In the great Ruhr coal field of Germany, which is flooding Europe with reparation coal, the average days worked normally exceeded 200—that is, our principal competitors are geared for a 290 or 300-day year, while we are geared for a 200 or 220-day year. To refer again to Garnsey, Norris, and Allport's table, it is as if we were affected by a 40 per cent decrease in car supply, while our competitors were running full time. We must therefore carry a 29 per cent handicap in cost f. o. b. mine, or, say, 58 cents a ton. The American hare must look out for the European tortoise.

The last item that I wish to mention, but an item that in no respect least deserves your attention, concerns the product of industry. Any formula for national prosperity must include a plan for a more equitable distribution of the benefits than now prevails; prosperity must be spread over the whole country. The working up of our abundant raw materials by skilled American workmen operating high-powered machinery on a full-time schedule will surely mean production of what the world needs at low costs, but to whom do the proceeds belong?

The product of the coal mine or of the steel plant is plainly a joint product—a product in the creation of which both capital and labor have joined effort—so that it is equally plain that product sharing must follow. Note, please, that I avoid the term profit sharing, for these are days when too often there are no profits to share, and, moreover, for too many centuries has a sharp distinction been made between wages to labor and profits to capital. The value of the product includes everything and should rightfully be shared by both.

The British coal settlement put into effect last July impresses me as a long step toward the full recognition of labor and capital as partners. It is too soon to know whether this settlement will work out in practice so as to satisfy the mine worker by giving him the wage he wants and satisfy the mine operator

by yielding cheaper production and larger output, yet I believe this settlement expresses true economic theory. First of all, the British plan puts the emphasis upon what ought to be the obvious rule in all industry—that of gaging wages by results, a sliding scale that works up and down automatically with the net returns of the business. Second, this sliding scale applies to both partners, for the standard wages to capital, unfortunately called "standard profits" in the agreement, are proportional to the standard wages paid to labor—a significant recognition that operating costs must include payment of wages to capital as well as to labor before there can be any surplus available for distribution. Incidentally, the agreement further provides that if the proceeds from the sale of coal are insufficient to pay more than the standard wages and other production costs, thus defaulting in the payment to capital, this deficiency is carried forward as a first charge against any future surplus.

Finally, under the terms of this British coal settlement, after invested capital is paid its determined wage of 17 per cent of what is paid to labor, any surplus remaining is divided 83 per cent to labor and 17 per cent to capital, a division of net returns that seems equitable in its general principle and probably fairly correct in detail. This is an example of product sharing, and its inherent justice ought to appeal to both mine worker and mine owner and thus clear the atmosphere around the pit mouth. The mine worker should see that his wage depends not so much upon the market price of coal as upon his own effort in lowering its cost, that he will share in the company's success in selling coal at a profit, that he is in truth a partner in the business.

Last August, when I discussed this new plan with representatives of the British coal industry it was far too early to judge the plan by results, but there was hope for a larger per capita output—a hope based in part upon reports from the mines. Cheaper coal seems absolutely essential to Great Britain's domestic industry and foreign trade, and this stimulation of the coal miner by offering him a tangible share in the product of his labor is both just and opportune. And inasmuch as American industry in general also needs cheaper coal, it may be equally opportune for us to consider as a leading item in our prosperity program some plan for product sharing that, because it is just to both labor and capital, will speed up our coal-mining industry and benefit all the industries dependent upon it.

But no plan of product sharing will help unless we have the product to share, the proceeds to divide. After discussing these four items in a prosperity program, I can sum it all up by saying with my friend Mr. Ingalls, "The only foundation for prosperity is production, and in the present juncture the needs demand the labor of everybody for at least eight hours per day and six days per week for such wages as can be got." Under those terms there may again be good times to be shared by all.

CHAIRMAN LORING: Remember that you have the right to discussion after each speaker, and we would be very glad to allow each speaker three minutes.

MR. E. S. MOORE (State College of Pennsylvania): Mr. Ludlow has suggested that I tell the meeting what I heard the other day from a coal operator who has recently been in Europe. He said that he visited South Wales where this scheme that Dr. Smith spoke of is in operation. As near as he can determine, he says the scheme works out this way; the miners are not satisfied to take a reduction in wages at the present time. This means that the coal costs more to produce than the selling price at this time; as a result, therefore, the operators sell the coal at a certain price; they pay the miners the wages they demand; they subtract the difference between the selling price and the cost of the coal, and the government makes up the difference. But the difficulty arises here: that the fund provided by the exchequer is exhausted and since the government is not in a position to keep this payment up indefinitely, they are coming to the limit of the possibilities of such an agreement, and the public is having to pay the bill. I thought that it might be of interest to you to hear the opinion of a man who has been on the ground and has seen the workings of this scheme.

DR. SMITH: I might add to that, that I not only agree with that statement, but that was almost forecast last August. The idea of the ten million pounds subvention by the government was to ease down the miner. As the operators said early in August, the question would come up, would the miners be eased down in this matter of wage reduction, and, of course, it was realized that when the government subsidy terminated, we were bound to have the same question come up. It is largely a question of whether the British miner will see which side his bread is buttered on.

MR. C. O. BARTLETT (Cleveland): This is one of the most interesting talks that we have ever listened to, and it does bring home the great importance of the present time to every one of us. As the speaker said, the mining question is a great big one. Just now scarcely any of us know just the condition of the other fellow. We are blaming one another throughout the United States, we are finding fault with the retailer, we are finding fault with the coal miner, we are finding fault with the different ones, we are finding fault with the banker, the shoe dealer, and all along the line. Now we are assembled here from all or nearly all the states of this country.

Now many of us have been sent here by different associations. For instance, I am sent here by the city of Cleveland, Ohio, by the Chamber of Commerce and the Metal Trades Association, and before I came I got all the information I could regarding the conditions of mining and business generally. I talked with a man from San Francisco this morning, who is a representative of that city. I would like to know the conditions of San Francisco. This Association ought to know them.

I talked with another man here from South Dakota. You may not know that there has just been a terrible strike in one of the greatest gold mines in the world—the Home Stake Mine. It is the only place I know where the strikers have had sense enough to go back to work at pre-war levels and on a pre-war basis.

I would like to know more about that. I understand that mining conditions are getting much better in the Black Hills in South Dakota. I think we ought to have more discussion along this line, so that we who are sent here as representatives from different parts of the country may know the actual conditions of the other states.

The mining question is a great, big question; it is a very important one.

DR. F. C. HONNOLD (Illinois Coal Operators' Ass'n.): There is one feature of Dr. Smith's article that I would like to speak on for about two minutes for the benefit of those who may be present who are not interested in the coal industry.

Dr. Smith lays, and very properly so, substantial stress on the economic waste of the short work year in the mining industry. I wouldn't have any man not directly connected with the coal mining industry leave here, if I could help it, with the idea that the responsibility of that waste rests with the industry. To the contrary,

the responsibility rests directly with the public. We are there to mine and sell coal when it can be mined.

We hear a great deal about the longer time operations in the anthracite mines. Why? Because that coal is of a character that can be mined and stored indefinitely for any number of years at almost any place to which it could be economically distributed. That is not true of bituminous coal. It is not true because bituminous coal deteriorates, first as to the contents, next as to its size. So that bituminous coal deteriorates to such an extent that it cannot be stored in large quantities. The only place where bituminous coal could be stored successfully is at or near the point of consumption. The American public are definitely improvident. The American public, contrariwise to our countrymen abroad, will not put coal at the point of consumption and wait for conditions to arise which will cause them to need a larger supply.

We have approximated a so-called technical three hundred days a year. We have done that because we cannot store that coal at the mine and the consumer will not take care of it. The average consumption of coal in the temperate zone runs from nine to twelve tons a year in the north—not a heavy burden for any household to buy and put in. But the facts are that they won't do it. It is a fact that prior to the first day of October in any year, the coal trade has never sold more than twenty-five per cent of the total demand. Therefore, we carry from 7,000,000 tons, or thereabouts, to a maximum peak of 30,000,000, an absolutely impossible burden for our railroads to carry under normal conditions.

I wonder how many of you know that every third car the railroad hauls carries coal. Far more miners than we need to produce coal must be retained in order that we may meet your peak demand.

Again coming to the American public, we have the same question. You want to go to the theatre, and instead of buying your tickets three or four or five days in advance at the box office to be prepared, you buy your tickets from a broker the night you want to go, and you pay him fifty cents or a dollar as a premium, and get exactly what you would have gotten with a little foresight. It is characteristic of the American people, it is characteristic of the way we live. We are crowding ourselves into flats and apartment buildings and small, incomplete places where we can't store the things to carry us over any period. What a

large per cent of us today are living off of the delicatessen; we don't even cook our own food. We don't even take care of our partial requirements by means of a cellar.

The responsibility lies with the consumer. We must teach the public to recognize that responsibility; when they realize it and act to meet it and we don't have to retain these men in industry to produce the coal you need at peak, the public will get the benefit of it to the extent of reductions in their price of coal. (Applause.)

DR. SMITH: You know to whom I referred when I spoke of the best authority on the subject of the coal industry of Illinois. I mentioned that to somebody yesterday, and he said, "They will know that you mean Dr. Honnold but they won't necessarily believe what he said." I believe that Dr. Honnold knows the situation, and I agree absolutely with what he has just said. When I am facing an audience of coal consumers, I talk to them just that way—that the problem is their problem, the responsibility is their responsibility and one of the reasons for high cost of coal is the fact that they don't buy it when they should.

CHAIRMAN LORING: Mr. Bartlett wanted to hear something about mining in California. I suppose it will be up to me to say something about California. I happen to be a son of the Golden West.

You will probably hear in various circles and on the streets that conditions in California are getting better and easier. I want to tell you they are not getting easier. Not a single, solitary mine has reopened since the war came to an end. Many mines closed down when war was declared, or soon after, due to the rising cost of supplies and increase in wages. The wages on the Mother Lode, prior to the war, were never more than $3.00 per day for the miner on an eight-hour shift. We gave them three different increases—fifty cents a day each—to bring them up to $4.50. Since the war came to an end and since some of the mining supplies have been reduced and the cost of living slightly reduced, we cut the wages fifty cents a day in one section of the Mother Lode, and we have had no trouble at all. With the cut the efficiency increased—that is the efficiency of each man.

The reverse took place at Grass Valley not long ago—one of the big mining centers of the West—when the increases that took place during the war, which were extravagant, were cut and they

tried to reduce the wages a dollar a day. The result was that two thousand men walked out, closing down all their mines in the Grass Valley District. They have since returned to work under protest, pending a settlement of their dispute by a commission that is to be appointed.

Millions of tons of ore developed prior to the war in the great Mother Lode of California are lying idle and cannot possibly be worked under present working conditions.

I happen to be a very large operator myself, and I have a number of mines. After spending several million dollars on the development of several mines on the Mother Lode prior to the war, it became necessary to close down because instead of a profit of $1.25 per ton, as we figured, which was quite easy to obtain prior to the war, this profit vanished, together with a dollar and a half a ton. So naturally there is no sense in going on under those conditions. Those mines are still closed down.

The prosperity of California that you might hear about so far as California mines are concerned, is simply gained by gutting them and taking the best ore out of them; if this thing goes on, there will be no mining in California at all in a few years because of the large bodies of ore that have given life to the California mines that are prohibited from development.

If there is no further discussion, I have the pleasure of introducing Mr. A. E. McGregor, Consulting Engineer of Arizona.

MR. A. E. McGREGOR: Mr. Chairman and Delegates: I want to make a plea for sound economic propaganda and more of it. My contention is that we do not get much economic propaganda and what little we get is often distorted and unsound. Many of our labor leaders go up and down the country preaching unsound economic doctrine and not much effort is made by those who know better, to correct it.

They tell us that wages must not be reduced now lest the standard of living of the American working man be lowered. They tell us that the machine is enslaving the worker; and that the machine takes from men their identity and opportunity for self expression in industry.

You men of affairs know that it isn't wages as measured by gold that has set the American working man's standard of living, it is what he has been able to get with his wages that has set his standard of living. What he has been able to get with his wages

has resulted from the better efficiency, the use of machinery and the reduction of labor per unit of output.

The building contractor, for the use of his tools and for his management, gets a small percentage on the cost of the building he constructs. His percentage is on the cost, the greater the cost the greater his profits in dollars if he is successful. His profit is only a small percentage on the average. If he should divide his profits with his workers, it would not appreciably enhance their pay in most cases. If the contractor fails to make a profit he is soon forced out of business.

On a job requiring a given quantity of brick work the contractor figures to make twice the profit if only 1000 brick are layed for $6.00 as he does if 2000 brick are layed for $6.00. In the same way, the higher the standard costs of the other parts of the work, the greater will be the profit the contractor must figure in dollars and cents on the work he performs. In normal times you never hear of a contractor trying to increase the cost of the materials and labor entering into his work. Why? He knows that the lower the cost of building the more he will be called upon to do. He knows that he will perform more work in the long run and make more profit, if wages and the costs of materials in his line are reasonable. He is interested in keeping down the wages of his workers so that there will be work for him and them in building homes for the workers in other lines of industry and in stimulating more building in general.

The contractor finds a small profit on a large turnover more profitable in the end. He knows that competition will prevent him from making a large profit on a small turnover.

It is just so in all other industry, management and capital in all lines occupy the same position with their workers that the contractor occupies with his.

The most prosperous concerns in our country are those which are taking a very small percentage profit on a very large output.

It is this tendency that has reduced the amount of labor required in the production of the many material things we desire in life.

It is this increased efficiency in all industries that has enabled the worker in one to obtain more of what he desires of the products of the others.

It is this that has raised the standard of living of the American working man and not the amount of his wages measured in gold.

When the labor required in the production of commodities is reduced to one-half the present amount, as it will in our onward progress, people may take their choice between working one-half as many hours to maintain their present standard of living or they may work the same hours and maintain a standard of living twice as high.

Instead of the machine enslaving the worker, as some of our labor leaders have claimed, the machine sets the workers free.

Each grain binder at harvest time does the work of 100 men and sets them free to pursue other useful and less irksome duties.

Think of the slavery we would be in to clothe ourselves, were it not for the cotton gin, the cotton and wool spinning and weaving machinery, sewing machines and shoe making machinery.

The machine makes for democracy in industry.

In previous generations it was difficult for the worker to shift from one line of industry to another. The war demonstrated that the housemaid can be readily trained to satisfactorily operate intricate machinery of precision.

They say machinery robs the worker of his individuality and his chance for self-expression in industry and society. Is it more dignified and satisfactory to be one of a hundred diggers in a trench than to be one of the several operators of a trench digging machine?

Would the driver of a grain binder rather be one of a hundred men, women and children cutting and binding the grain by hand?

Would the operator of a machine turning out perfectly made bolts by the hundred each day take more pride in turning out only a few hand made bolts each day?

Corresponding to those specially skilled in the guilds and trade unions in previous generations we now have the foremen and experts. Does not the expert in designing his new machine, that will reduce the labor of making a commodity and will be an aid to mankind, get as much satisfaction as did the expert worker in previous generations in turning out his hand-made product? And is not his opportunity for self-expression fully as great?

Has not machinery given the worker more time for diversion and thought for self improvement?

There is a great need by the workers and the public generally for a more sound understanding of the economic principles underlying industry.

The workers in each industry should realize that the demand for what they produce comes mainly from the workers in all the other industries.

High wages or inefficiency in one trade or one industry are paid for by the workers in all the other industries.

The employer in one industry is the buffer between the workers in that industry and the workers in all the other industries often called the public.

The workers in one industry should realize that really back of their employer's interest lies the interest of all the other workers in the other industries; and the employer's main concern is to keep the cost of his production down to a point where there will be a good demand for his products from the workers in the other industries.

In standardized industries in normal times there is no opportunity for excessive profits for periods of any duration due to the keenness of capital for profit and its alertness to change from unprofitable to profitable lines.

In the mining and oil business, and other hazardous undertakings, it sometimes happens that capital is very highly rewarded. It should be better understood that this must always be possible in order to offset the losses in prospecting and development so common in these undertakings.

It should be understood that the best interests of all are served when capital, which furnishes the machine, receives a just profit, and labor, which operates the machine, receives a just wage. The unrelenting law of supply and demand largely determines what is just in each case.

It should be understood that capital must have interest to thrive just as surely as labor must have wages. Labor always receives wages as it must, whether capital receives interest or not.

Machinery has replaced various groups of workers from time to time. Our constant desire for more and better things in life always puts such groups of workers into profitable employment in other lines, and the standard of living for all is thereby improved.

It has been found that there can be unjust combinations in the organization of capital. It must be recognized that there can be unjust combinations in the organization of labor.

Our highest standard of living in this world will not be attained while industry is burdened with taxes for any war of destruction, past or future.

Measured by the gold standard a worker in this country is now getting ten times as much as the same grade of worker in Germany.

This very great difference in the gold value of a day's work here and a day's work in Europe cannot continue indefinitely. We have means of transportation, we have good connections for the interchange of labor and commodities with Europe. The gold value of these will more nearly equalize as surely as the water levels in two tanks will equalize when a connection is made between them, the level rising in one and falling in the other.

The gold value of European labor and commodities is bound to go up and the gold value of American labor and commodities is bound to come down. Any ordinary tariff barrier will be of little hindrance to equalization while the present wide difference in price levels exists.

The wide destruction of capital in the countries of Europe during the war and their reckless parting with their gold for war supplies has made a very abnormal demand there now for gold with a corresponding abnormally low gold value of wages and commodities. This with our own inflation and dependence upon Europe for the disposal of our surplus products may force our own price levels below pre-war levels. In other words we may have to give more labor and commodities in exchange for gold than before the war. Fortunately for us, gold is not a food, neither do we use it for clothing or building material, otherwise our standard of living might suffer.

We have fixed standards for the measurement of time, distance, weight, etc. In effect we have yard sticks of fixed lengths for the measurement of these.

When it comes to a standard of value very unfortunately we have a yard stick that varies in length. We have not been scientific enough, or practical enough yet, to devise a standard for value that will not vary. At some future time this may be

accomplished. In the meantime we should recognize this defect in our standard of value and accustom ourselves to more rapid adjustment to it. We should realize that this difficulty with our standard of value is in the main more mental than real.

If we could recognize the change in our yard stick of value and keep commodity prices and wages closely adjusted to it, with intelligent attention to the supply and demand for our products, we, the workers in industry and producers in every line would not feel dull times and our current purchasing power would be as great one time as another.

After the war broke out, Europe in her frenzy began dumping her gold upon us in exchange for war materials at exorbitant prices. After we entered the war we had inflation and reckless spending by our own government with more cheap money.

Our yard stick of value shrank in length until it was about one-half its pre-war length a little over a year ago. It is now growing longer and may exceed its pre-war length before it stops. While the shrinkage in the length was going on it did not pain us who were producing. We had the sensation of growing richer and were quick to measure commodity prices and wages by the changing yard stick as it grew shorter step by step and we did not do much to hinder its tendency to grow shorter. We do not enjoy the reverse operation now and are slow to admit we were under a delusion. We are not nearly so quick about measuring our commodity prices and wages by the increasing measure of value.

Henry Ford apparently saw the light and did not hesitate to accept the new measure and by keeping his prices adjusted to it is making money in a falling market.

Our hesitation is halting industry upon which our well-being and civilization are founded.

The trouble is mental. It requires mental treatment.

The leaders of capital in the basic industries are not living up to their opportunity and in many cases are as much to blame as the leaders of labor. Our need for patriotism and self-sacrifice in industry did not end with the armistice.

If Mr. Ford's industry can prosper in these times under adverse conditions it is a certainty that if his policy is pursued in our other industries, they too will prosper.

If the cost of transportation, coal, iron, lumber and wages in the building trades were now as near to pre-war prices as the factory price of Ford automobiles, I wonder if we would not be having pretty good times in the building trades. What would happen in our other lagging industries under similar treatment?

Any business man, except possibly a banker who attempts to have his net assets, when the normal price level is reached, equal to their inflated war-time amount in dollars and cents, is a profiteer and is only retarding the return to normal and, on the whole, is doomed to disappointment.

By attempting to sell at cost or only a little below cost in a falling market, or in other words, at a time when the value of money is increasing, the seller may be asking too much profit and his insistence only retards the return to normal.

In a falling market the seller of commodities need not hesitate to sell below cost as no losses will be sustained as long as the selling prices are not below the new general price level to be established.

In a falling market, if the retailer sells at a price equal to or above the new general price level to be established, no matter how low this may be, the purchasing power of the money received will be equal to or more than the purchasing power of the money put into the cost.

The borrower made his profits in the rising market. It is inevitable that he must take losses in the falling market. In general his hesitation to liquidate only increases his losses and postpones the return of normalcy and his opportunity to regain his losses.

We should recognize the influence of the rest of the world upon us, and we should recognize the effect that Europe's demand for gold is going to have on our price levels in this country.

We should anticipate the change in our measure of value. There is harm in delay. Aside from lengthening the pains of re-adjustment, the vitality of our patient will be sapped and recovery will be slower. Many corporations have laid by cash reserves for further development of our resources, for plant improvements, dividend disbursements, etc. They are solvent now. The same is true in smaller business. The workers have put by accumulations for building new homes and other purposes.

If we all wait until we are forced to take lower prices, and lower wages or go hungry and wait until the inevitable is upon us, these surpluses and accumulations will be gone and many companies will be insolvent. The surplus capital now available for stimulating industry, in all lines, will have been dissipated.

If we wait, we will have much greater difficulty in getting back to normal again.

Cuts in prices should be made from time to time in every line, including wages, sufficient to get business and give employment to labor.

As well as "buy now" the slogan might well be, cut prices until you can sell. Labor should follow the same policy.

We have indulged in a great deal of talk during the war and since, to the effect that prewar price levels for wages and commodities will never return. This means, in other words, that gold must always be cheaper than it was before the war. How has the war permanently reduced the cost of producing gold? We can see where the waste of war has increased the demand for gold in Europe many fold.

We hear talk about assisting ourselves and Europe by establishing their credit. It is to be hoped something can be done along this line; it looks as if what Europe wants is gold and she seems to be willing to pay the price. As indicated before, European labor is now bidding ten times as much for it as American labor.

Apparently we have big readjustments yet to make. It is important that there be the widest possible employment of labor to avoid suffering. Only the application of intelligence and the wide use of the golden rule can save us from a bitter experience.

In the copper mining and smelting industry in the West, for a number of years we have had sliding wage scales based upon the selling price of copper. While these scales are not economically sound, they have worked. A sound wage scale during times of readjustment like the present would be based upon the cost of living. If we would accustom ourselves to basing our maximum wages upon the cost of living as expressed by the average retail selling prices of food, clothing, fuel and building materials, it would be a great assistance to us in easing ourselves over this painful period of readjustment.

Our government could be of aid to us in compiling and giving

publicity to the figures which determine the cost of living upon which our wages could be adjusted from time to time.

Prewar standards should be used as the basis for the adjustment of wages to the cost of living. To illustrate: If a government board found that the cost of living here in Chicago as indicated by the retail cost of the index commodities is 40% higher than it was in 1914, then it should not be good form for machinists, carpenters or any other craftsmen or class of labor or the professions in Chicago to ask more than 40% more than the 1914 standard of wages or fees.

There is no just reason why rents should not follow down with the cost of living.

During the changing price levels wages and rents for any month should be governed by the cost of living in the previous month.

If followed this would overcome the injustice of the present hit and miss wage and rent reductions, where due to active competition the wages and commodities in some lines are near to prewar levels and all are benefitted by the lower living costs resulting, while in other lines 1920 profiteering wages and commodity prices still prevail.

Following such a system of adjusting our wages and rents to our changing yard stick of value would expedite our return to normal with a minimum injury to all concerned.

Our excess capital has been the great instrument in the development of our resources and in furnishing the machinery, which have resulted in the high living standard of the American working man. Europe is already attracting our excess capital and promises big returns to it.

Failure of our business men and our workers to read aright the signs of the times and take proper corrective measures will send much more of our capital to Europe to assist the workers there in capturing the world's markets and in making their competition more keenly felt in our own markets.

My plea is for sound economic propaganda, and more of it, by the leaders of management, as well as by the leaders of labor in every industry.

We can sit by and allow our economic illness to continue unabated, running its course with long after effects, as did the plagues of old; but it is time we were using intelligence and by

a campaign of education stamp it out and rid ourselves from its ravages.

All employers should feel it their patriotic duty to see that they themselves, their foremen and more intelligent workers everywhere have a sound understanding of the economic principles underlying industry and production.

I am for this Congress going on record as recommending that the Mining Companies assist in bringing about a better understanding of these principles.

We need more preachers of higher wages for the worker in terms of what the wages will purchase, which means better cooperation between capital and the worker in the reduction of the labor required in all industry per unit of output.

We want fewer makers of discord between the worker and capital in industry. We must recognize variations in our measure of value. The value of gold through the ages has had wide fluctuations as measured by living standards and commodity prices. This variation in the yard stick of value has been a stumbling block in our industrial and social progress long enough; it is time we understood it and intelligently allowed for it.

MR. STEEL (Alaska): I have listened with a great deal of interest to these talks this morning, especially that by Dr. Smith, and I want to say that I have just returned from an extensive trip through the Northwest. I have found, first, that in the Middle West the farmer feels that during the war and after the war he has received a very bad deal from the government. The copper miner feels the same way—so does the logger, the lumber manufacturer—in fact most every man has that same feeling, especially where raw products and the manufacturing of such products are concerned.

In summing up this situation, from my own standpoint I feel that the only thing for us to do is to try as nearly as possible to forget what has happened, bearing in mind that we have just come out of the greatest war in the history of the world, bearing in mind that we all must pay, bearing in mind that we are paying now. It isn't only a question between capital and labor, but it is a question of paying the bills. The only way we can pay this debt, gentlemen, is by getting to work. We have been lying dormant in our part of the country. (I am talking now of our own indi-

vidual properties.) For the past sixteen months we have been idle, and I have decided, taking these things into consideration, that we have got to go to work. With this in mind, we are starting to work on further development of our properties in hope of better times when we will later on get some of the profit that we feel will be coming to us.

So far as the gold miner is concerned, he is in a particularly bad situation, for the reason that he got no benefits from the high prices obtained during the war, but the price of gold, measured by other values, went down. I can see only one relief for the gold miner; that is to pass a McFadden bill, which I think would be a great help, and I think it is the duty of the Congress of the United States and the people of the United States to see that the consumption of the gold that is not used or not necessary for monetary purposes be paid for by those who wish to adorn themselves by using this gold.

So far as the rest of us are concerned, I think the best thing for us to do is to try to adjust ourselves to the situation as well as we possibly can and get back to work. (Applause.)

CHAIRMAN LORING: I thoroughly agree with the last speaker in everything he says.

I see our Secretary, Mr. Callbreath, has just arrived. Would you like to say something, Mr. Callbreath?

SECRETARY CALLBREATH: Mr. Chairman, we have with us a speaker who is going to talk on a subject of very serious importance to all in this industry, and I think before we take much time with open discussion we had better listen to Mr. Greever, and after that I will be willing to talk.

MR. E. L. GREEVER: Mr. Chairman, Ladies and Gentlemen: It is difficult, if not entirely impossible, in the time allotted to me, to give anything like a comprehensive treatment of the West Virginia coal situation. In order to form an intelligent opinion on any subject, it is necessary to first have an accurate and full understanding of all pertinent facts. It is not strange, perhaps, that the public has not such knowledge of the facts in this case, but I think I am not going too far when I say that the public has formed its opinion, in large measure, (so far as any public opinion has been formed), not only without proper knowledge of the facts, but upon positive misinformation.

The United Mine Workers of America has, for years, conducted a carefully planned campaign of publicity, in which certain statements as to conditions have been made and reiterated with such persistence and such positiveness that the public has accepted them as true, although wholly false and known to be false by those circulating them.

I shall attempt to give in a few words some of the facts as they are, from which and upon which any intelligent conclusion regarding this matter must be based.

There is no strike in the non-union part of West Virginia today. The mines are all fully manned and are operating to the full capacity necessary to supply the present market demands, and, if the market becomes better, the output of coal can be increased, with the present employees, to meet it. The present fight in that part of West Virginia, so far as the purely labor question is concerned, is a fight by the United Mine Workers of America against men who are not members of it and do not wish to join it, to establish the autocratic rule asserted by it over all men who work in and around coal mines, and to deprive all individuals of the right of individual contract and the right to work for whom they please, upon such terms as are to them satisfactory.

It has been said and re-said, over and over again, that the mines of Mingo and Logan Counties have been guarded by thugs and gunmen paid by the operators and furnished by the Baldwin-Felts Detective Agency.

Every man who knows anything at all about this matter, knows that there never has been, in the history of those two counties, any paid mine guard furnished by the Baldwin-Felts Detective Agency. In Mingo County, a number of Baldwin-Felts men, some of whom were deputy sheriffs of that county, were sent to Matewan on one occasion, May 19, 1920, to evict certain miners from the houses belonging to one of the coal companies, and this action was taken under advice of counsel. No resistence or protest was made by the occupants of these houses, but while the Baldwin-Felts men were waiting for the train on which they were to leave Matewan they were suddenly attacked by a volley of bullets, and seven out of the ten were killed, without any opportunity to defend themselves at all. However, this is the sole instance in which the Baldwin-Felts

men did anything which might come within the description of the activities of that organization. In Logan County, there has never been any employment of the Baldwin-Felts men, whatever. In Mingo County, there has been no employment of deputy sheriffs by the coal operators, and no payment of their salaries, or any part thereof, by the coal operators, but it did appear in the senatorial investigation that at least one deputy sheriff in 1920 received pay from the county and was likewise on the pay-roll of the United Mine Workers of America at $175.00 per month.

Logan County has an area of about 475 square miles and a population of about 65,000. It has three magistral districts. The peace officers provided by law for said districts are two justices of the peace and two constables. When it is remembered that there are about 65 mining operations in the county, each of which is the centre of a considerable population, it is clearly apparent that the police protection provided by law in the justices of the peace and constables, is wholly inadequate. The preservation of law and order in all communities is an absolute necessity, and the relative number of policemen in all cities, where the population is centered, is far greater than that provided by law for Logan County, where the population is spread over the large territory mentioned. Under these conditions, the very necessities of the case demanded that some provision to preserve law and order be made by the citizens. To carry out this object, the sheriff has been accustomed to appoint a number of deputies, whose appointments are approved by the County Court and they give bond, as the law requires. They are authorized by the Circuit Court to carry arms, and then only after strict proof of good moral character and fitness. Any attack upon them is, in reality, an attack upon the integrity of the courts. The coal companies have contributed to a fund turned over to the sheriff, out of which the sheriff pays the salaries of these deputies. It was a choice between this method and having no police protection. Theoretically, the State should pay all of its officers, and private individuals and private corporations should not be obliged to contribute anything to their salaries, but West Virginia is largely an agricultural State, and the representatives in the Legislature from the agricultural sections have refused to agree to increase county levies to an

amount necessary to enable the counties where coal mines exist to collect sufficient taxes to pay the necessary number of these officers. Nevertheless, it is a fact that the men selected by the sheriff to be deputies, and approved by the County Court, have been men of high character, and not ruffians and thugs; and, if anyone had been assaulted, or in any way abused, by one of these officers, the courts were open to him to indict and punish the guilty one.

It is submitted, therefore, that anyone endeavoring to make up an intelligent and unprejudiced opinion as to the situation in West Virginia must do so upon the basis of fact that no Baldwin-Felts' thugs or Baldwin-Felts' representatives of any kind, have or are employed in Mingo and Logan Counties, and that Deputy Sheriffs have been employed or paid by the operators in Mingo County, and that the arrangement stated as to Deputy Sheriffs in Logan County is absolutely necessary and is made for the sole purpose of preserving law and order, with every protection of the law existing on behalf of individuals as against any unlawful acts committed by these Deputies.

That this arrangement is perfectly proper and defensible even from the standpoint of the United Mine Workers of America, might reasonably be assumed from the fact that the "Temple of Labor," in Washington, in which Samuel Gompers, President of the American Federation of Labor, to which the United Mine Workers of America belong, and his subordinates, occupy most comfortable offices, is guarded by a uniformed member of the police force of the District of Columbia, duly qualified as such officer, but whose salary is paid by the American Federation of Labor. Not only that, I understand that the Federation actually pays to the District of Columbia $2.00 for his police badge and the privilege of wearing it.

The United Mine Workers of America, however, is not content with attacking the Baldwin-Felts men and Deputy Sheriffs, but its hostility extends to the West Virginia State Constabulary, the duly and lawfully constituted police department of public safety, created by statute, the members of which are carefully selected for their peculiar fitness for the duties required of them, and all of them, or practically all of them, being over-seas veterans. The same sort of abuse and epithets are applied to the State police force as are applied to the Baldwin-Felts men and

to Deputy Sheriffs, and three of them have been shot in the back and killed.

Not only that, the United Mine Workers of America have likewise opposed the organization of a State Militia and the National Guard in West Virginia, and have attacked, by all sorts of abuse, the officers selected by the Governor for this purpose, and have killed at least one member of the Kentucky State Militia sent to the Tug River section to preserve law and order, by shooting him in the back.

Further, the United Mine Workers of America have opposed every plan suggested for the organization of any kind of police force, and have abused and vilified every Governor of West Virginia, from Governor Glasscock down to the present, whenever such Governor has done anything, whatever, to curb and restrain their unlawful acts.

In this connection, it is perhaps pertinent to say that no reason is perceived why anyone not a law-breaker should object to the employment by any person or corporation of any guard or number of guards he or it might see fit to employ. What difference can it make to a law-abiding citizen, one who has no desire or design to destroy the property of another, whether that other has guards over his property or not? As a matter of fact, every Bank in the country, every large office building in the country, every manufacturing plant in the country, every Government building in the country, has an armed guard or guards to protect it; but, because, they say, the coal operators of West Virginia have employed guards to protect their property, the United Mine Workers of America rush into print time and again and make the existence of mine guards an excuse for their own lawlessness in West Virginia, and even their Washington attorney has assigned the existence of mine guards as the cause of the trouble. The right of personal self defense and the right to protect one's property are rights as old as Magna Charta, and anyone who attacks or questions either of these rights in effect admits that he has intended to do violence to person or property and has been prevented from so doing by the existence of guards.

The coal fields of the United States are divided, broadly, into two classes, the Union fields and the non-Union fields. In the Union fields, all men who work in and around coal mines are members of the United Mine Workers of America, which claims

to be a voluntary and irresponsible organization, and no man is permitted to work in or about said mines unless he is a member of that organization, in other words, this is a strict application of the "Closed Shop." The Union officials meet with representatives of the operators, and contracts are entered into, covering all of the Union fields, in which wages, hours, conditions of labor, etc., are specifically set out, and all men working in and about these coal mines must work under the terms of these contracts.

In the non-Union fields, no such arrangements exists, and the different coal companies contract with their men directly, each man taking employment under such terms as he, himself, agrees to accept.

The coal mines in Mingo and Logan Counties have always been operated free from any recognition of, or dealings with, the United Mine Workers of America, and under a strictly non-Union policy. However, it should be said that up to the time the United Mine Workers of America undertook, in the manner to be hereafter described, to force the operators in these non-Union fields to recognize the Union, and to compel all men working in and about these mines to become members of that organization, there was never any question asked a man seeking employment as to whether he held membership elsewhere in the Union or not, and no distinction was made between Union and non-Union men. This has not been the case recently, for the reasons I shall hereafter give, but all men accepting employment have done so with the express agreement that the mines are operated on a strictly non-union basis.

The result of the non-union policy in these two Counties has been highly satisfactory to all parties concerned. Every employee has felt that he was at liberty to make any contract agreeable to him, and has known that he could work free from any restrictions and limitations, such as are imposed upon its members by the United Mine Workers of America. As a consequence, the earnings of the miners in these non-union fields have greatly exceeded the earnings of the miners in the Union fields.

On the other hand, the coal companies have been able to direct their own business and manage their own affairs, free from the dictation of the Union, whereby they have been able to reduce the cost of production below the cost of production in the Union fields, while at the same time giving to their employees an earning power in excess of the earning power of Union mines.

The demands made upon the Union operators by the United Mine Workers of America increased year by year, so that in 1898, when additional demands were made, the operators of the Union fields, or particularly what is known as the "Central Competitive Field," composed of Ohio, Indiana, Illinois and Western Pennsylvania, protested and called attention to the fact that their cost of production, due to concessions made to the United Mine Workers of America, had increased year by year, while the cost of production in West Virginia, in the West Virginia non-union fields, had not increased, and that by reason of these facts the competition between coal from the Central Competitive Field and West Virginia had become so keen that West Virginia was taking away the common markets, and figures were given showing the great increase of West Virginia tonnage to these common markets. The operators at their conference stated frankly that they could not grant the new demands made by the Union unless the Union would agree on its part to unionize the coal mines in West Virginia for the express purpose of increasing the cost of production of coal in that State. An agreement was made upon these terms, namely, that the operators of the Central Competitive Field would grant to the Union the demands made by it, while, in consideration thereof, the Union agreed to unionize all the coal mines in West Virginia and to increase the cost of production of West Virginia coal.

Immediately thereafter, the effort to unionize the West Virginia mines was commenced, and it has been prosecuted ever since. The "open shop" question does not exist there. The union has thrown down the gauntlet and it must be either a closed union shop or a closed non-union shop.

The methods used by this Union to organize non-union fields down to 1912, while not always lawful by any means, do seem to have been in the main peaceful in their nature. In 1912, the fundamental character of the United Mine Workers of America was changed by an amendment to its Constitution. Up to that time, its Constitution had declared that its members were entitled to an equitable share of the products of their labors. At its 1912 Convention, that clause of the Constitution was stricken out, and for it was substituted a clause declaring that its members were entitled to the full social value of their product, and this expression was construed by that Convention to mean the

full sale price of the coal, less only the cost of transportation, thus leaving to the mine owner no return, whatever, on his investment. Immediately following this change in its Constitution, its methods of organizing non-union fields were also changed, and it then definitely adopted the use of force. From that time to the present, its methods may be summarized something like this: Organizers and agitators are secretly sent among the non-union employees of the mine which it is sought to unionize, where they appeal to the less efficient and more turbulent element among the employees, and secretly pledge them to the Union. This work is continued by bringing the pressure of threats and intimidation to bear upon the miners until a considerable number of men have secretly joined the Union, whereupon a demand is made upon the Company that it recognize the Union, which means that it will no longer employ anyone except members of the Union, and that would compel the other employees of the Company to join the Union or lose their jobs, and would take away from the Company the right to make individual contracts with its employees, and take away from its employees the right to make individual contracts for themselves. Upon the refusal of the Company to recognize the Union, a strike is called, and thereupon the members of the Union cease to work and begin a carefully worked out plan of abuse, threats, intimidation and assaults upon those who decline to quit, in order to force them to cease from work; and, further, if recognition of the Union is still refused by the Company and any of its employees remain at work, attacks are made from ambush upon the employees, the mining plant and mining village are shot at from the hillsides with high powered rifles and other firearms; and, if the refusal to recognize the Union still continues, then the destruction of property begins by fire or by dynamite, or both. To direct and lead this lawlessness, the organization's flying squadron of gun-men, experienced in such places as Colorado, Cabin Creek, and Oklahoma are sent in by it. This plan of violence, as will be seen, is carefully graded, and becomes more and more sinister as the fight progresses.

Mingo County has suffered all these grades of lawlessness, and every single act of violence and lawlessness in Mingo County has been the direct result of the activities of the United Mine Workers of America. There is not an instance where the non-

union miners, or the coal Companies, have been the aggressor, but in all these conflicts they have occupied the position of defenders. I recognize that this statement is in direct conflict with the statements made by the officials, organizers and agitators of the United Mine Workers of America and of a few newspaper correspondents who claim to have been upon the ground and to have investigated matters at first hand, but I know that the officials, agents, organizers and agitators of the United Mine Workers of America know that this statement is true, and I more than suspect that some, at least, of the newspaper correspondents referred to also know it.

The attitude of some newspaper reporters is easily explained, and with some justification, from their standpoint. One of them told me once that there was no news element in a story that a man day by day carefully and efficiently pursues his employment, but that for anything to be news it has to have the element of the unusual. Consequently, there is no news in the fact that over 5,000 men are at work day by day in Mingo County, engaged in the production of coal, being a sufficient number to fully man the mines, who live with their families in comfortable houses and are making good wages, running to $300 and more per month; but there is a news element in a story of a tent colony, where a lot of voluntary loafers and trouble-makers have forced their wives and children to live in discomfort upon the benefits paid to them by the Union, thus enabling them to remain idle and stir up more trouble. Then add to this general statement as to the tent colony the "sob" element of the pitiable condition of the wives and children exposed to the hardships of such a condition, and you have a story that has enough of the unusual in it to make it real news.

While the United Mine Workers of America has, ever since 1898, continued to strive to fulfill its part of the conspiracy then entered into, by endeavoring to organize all of the coal mines in West Virginia, it is not to be understood that it has done so solely under a feeling of responsibility to live up to a contract, because it has never hesitated to break a contract when it felt that it was to its interest to do so, and the Union County of Kanawha had 62 strikes in one year under the present contract. There has entered into this organization an ambition broad and sinister, which threatens the very life of American institutions.

This becomes apparent in the light of events which have transpired since the calling of the general strike, effective November 1st, 1919.

The nation wide strike of 1919 was called in direct violation of a then existing contract, and the President of the United States so declared. That strike failed in its object of tying up all of the industries of the United States and of freezing the people into submission, solely because the non-union fields were able to produce enough coal to keep the country going. Since then, the efforts of the United Mine Workers of America to unionize the non-union fields have been redoubled, and that organization is now engaged in a life and death struggle to complete the organization of the West Virginia fields, having failed in Alabama, and to do so before April 1st, 1922, when its existing contracts with the operators in the Union fields will expire. If at that time all of the coal mines in the United States have become unionized, this organization will have accomplished its purpose, that of becoming the most powerful body in the United States, Government itself not excepted. Why do I say this? Because it will then be able to fix all wages in all coal mines, to fix hours of labor at all coal mines to fix the amount of production of coal at all coal mines, to fix the prices at which all coal shall be sold, and it will have abolished the freedom of individual contract, all of which will result in its absolute control of all of the industries of the United States using coal as a fuel, which would, of course, include transportation.

It will thus be seen that the United Mine Workers of America is playing for high stakes, and the men in control of it are directly attacking American institutions, and are endeavoring to destroy absolutely all individual liberty. To carry out this vicious and treasonable purpose, they have not contented themselves with the usual and ordinary plans of violence heretofore referred to, but have gone much further, and have incited, fomented, organized, armed and directed actual insurrection and invasion of peaceful communities. Recent events are still fresh in the minds of the people, but unfortunately the people have been misinformed and misled as to what lay behind the march on Mingo County, through Logan County. As a matter of fact, (and it has been clearly proved), that march, instead of being a spontaneous uprising of men in the Union fields of Kanawha and

Boone Counties to go to the relief of miners in a non-union field, supposed by them to be suffering under oppression, as the publicity department of the United Mine Workers of America has sought to make the people believe, and as many do believe, was a carefully prepared insurrection. The United Mine Workers of America organized its army, armed it, and supplied it. Not only that, but a large percentage, (some place it as high as 90%), of the men in that army were compelled by armed Committees, under threat of death, to join it and engage in that march. The men responsible for that insurrection are as truly traitors to their country as was Benedict Arnold; and the offense for which John Brown lost his life was not as serious or as criminal as the offenses they have committed.

Disregarding, condemning and defying the Constitution and all law, this organization yet declares to its members that their Constitutional rights are trampled upon. While it relies upon violence and force to impose its will upon others and upon industry, its opponents resort to the courts, and it paid out, according to its Treasurer's report made at the recent Indianapolis Convention, during the past year, $411,000.00 in legal expenses, and this does not include what must be the far larger expenditures of the same kind made by the various districts. Nothing but lawlessness on a gigantic scale could account for such expenditures.

The United Mine Workers of America is able to carry on its campaign of violence and war because of the vast sums of money which it forcibly collects from not only its members but also all eligible to membership, and all men engaged in and about coal mining are eligible by means of what is known as the "check-off." One of the stipulations in the contracts between that organization and the operators in the Union fields is that the operators will collect each month from each employee, whether a member or not, through its pay-rolls, by what is known as the "check-off," all dues and assessments against him in favor of that organization, and these dues and assessments are declared to be a first lien on all of his earnings, taking precedence even over the groceries which he buys at the Company store for the support of his wife and children. These dues and assessments, it is stated, now amount to about $3.00 per month per members in West Virginia and $5.00 per month in other Union fields, and, as the organization claims a membership of 500,000, it will be

seen that it has an immense fund upon which to draw, to pay the expense of any sort of violence or insurrection which it sees fit to employ. It was admitted by William Green, Secretary-Treasurer of the National organization, at the recent convention in Indianapolis, that an effort to enjoin the collection of dues and assessments through the "check-off" was striking at the very heart and soul of the organization. In other words, that organization when it makes contracts, not only compels men to become members of it, but it also compels its members and all men eligible to membership to contribute to it whatever money it demands, and Mr. Green's statement is an admission that the men would not voluntarily pay this money.

The phrase, "Collective Bargaining," is deceptive, and really has no significance, if the definition of bargaining given by the Supreme Court of the United States be kept in mind. That Court says that there is no bargaining, in any true sense of the word, unless both parties act with absolute freedom, and entirely voluntarily. "Collective Bargaining," as practiced by the United Mine Workers of America in the Union fields, is not bargaining at all, but is the imposition by superior power of its own terms upon the operators. Not only this, but it is the declaration of the will of a few leaders, without any real participation by the members as individuals.

The time has come, it seems to me, when it is necessary to get back to fundamental principles and to recall the convictions of personal liberty and freedom which actuated the founders of this Government. The right of individual contract and the right of each individual to work when he pleases, for whom he pleases, and upon such terms as are to him satisfactory, free from the domination and control of anyone, are rights which should never be abridged or questioned. This would guarantee to a man the right to enter into any lawful organization having a lawful purpose, and to engage in the promotion of that purpose by lawful means, but it would prohibit him from compelling anyone else to become a member of that organization, and would guarantee to a man who did not become a member of that organization the right to remain out of it, without his being thereby compelled to cease from engaging in his chosen occupation. If these rights be protected by the Government, be protected in reality and to the proper extent, there would never be any more trouble with

the United Mine Workers of America, or any other similar organization. That protection should come from the Government, because it is the function of Government to protect personal rights; and when it fails in so doing it has failed to do its duty. If it fails to perform a duty so simple, so old, so well understood and established, it would seem hopeless to expect it to enforce any of the more complicated, uncertain and untried governmental regulations that have been suggested. The law now provides that an owner of property may do with it as he sees fit, provided it be not to the injury of another, a necessary part of the right of ownership of private property, and that right must be protected or we will inevitably be led into socialism, which is but the ante-room of Sovietism and anarchy.

Of recent years, we have gotten into the habit of running to the Federal Government for relief in any and all kinds of trouble. There seems to be an idea abroad in the land that the Federal Government can do anything and regulate anything, although experience has shown that the Government has never yet undertaken to regulate or direct any kind of business without greatly increasing the cost and decreasing efficiency.

Some have thought that the Federal Government ought to interfere in West Virginia and do something to settle the difficulties there. It is said that, because a body of armed men marched upon Logan and Mingo County for the avowed purpose of compelling the miners to become members of the United Mine Workers of America and of protesting against the lawfully constituted authorities of West Virginia, the Federal Government should step in and take control of the coal properties in those two Counties. The case is exactly parallel to what your case would be if your house should be broken into by robbers and, when you reported the matter to the police, the authorities should say, as a remedy for your wrongs, "We will take possession of your house." There is just as much justification for one as the other. Apparently all of the many legislative remedies suggested are tainted with the timidity or cowardice, back of that sort of muddling of a simple problem, which shrinks from a stern and impartial enforcement of the plain rights of person and property upon which civilization and our system of government are founded.

The West Virginia struggle is but a phase of a general situa-

tion. Today the country is facing a nation-wide tie-up of railroad transportation, which will work incalcuable injury to the people as a whole and will entail great suffering—all because railroad employees declined to adjust themselves to existing conditions. Others are doing it, but they refuse. As an illustration, consider the situation of the farmers today. In my section of the country, farmers last fall paid from 10½ to 12 cents per pound for stock cattle to be marketed this fall. They fed them all winter on high-cost corn and have grazed them and fed them all summer and are now selling them at 6½ cents. Nevertheless, the railroad employees refuse to go back even to the wage scale of 1920, and declare that these farmers shall pay, out of their poverty, the existing high freight rates on what they produce and on what they consume. The number of farmers exceeds the number of railroad employees by several millions. Suppose the farmers should take a similar arbitrary position and refuse to sell foodstuffs at less than 1920 prices? Of course, reliance is placed upon the old assertion that farmers can never be organized, but that is by no means certain today. Suppose the farmers should go further and refuse to permit any railroad employee to have any product of the farm, at any price, during the strike? Would their conduct be more reprehensible than that of the strikers? This arbitrary and ruthless exercise of irresponsible power by labor organizations is the greatest of all dangers that threaten our institutions. It is a species of super-government, not "of the people, by the people and for the people," but by a few at the expense of the people. The cool insolence of its stand is fully expressed by a statement attributed to one of the most prominent of the railroad employees' leaders—"The public had best get its walking shoes on"—which is his adaptation and adoption of "The public be damned."

While the "right to strike" has been recognized by the Courts the time will come, if Civilization advances instead of retrogressing, when "the strike" will be recognized as what it is—the use of superior force to compel a required concession—and will be made unlawful, as it really is now under sound legal principles, we have even now reached the point of advancement in the recognition of the rights of the people as a whole where our law makers should have the courage to make it criminal, by statute, for employees of a public utility to injure the innocent

public by a strike, which, in such case, is nothing more nor less than a conspiracy against the public welfare.

It is to the larger aspect of the contest in West Virginia that I now wish to call your attention. That is the only justification for my being here and taking a part of your time. We are not fighting on behalf of the personal interests of a few coal operators, or even for the welfare of West Virginia alone. That struggle is not one against a trade union movement, having for its object the betterment of the condition of its members; it is not a struggle between labor and capital; it is not a struggle in which the wronged are seeking redress of their wrongs; it is not a struggle to appress and enslave the workers. It is a struggle to maintain law and order against the lawless destroyers of life, liberty and property; it is a struggle to maintain, for the workers, their individual freedom and the right of individual contract; it is a struggle to maintain the American ideal that every individual shall have full scope for the development of his own powers, an opportunity to bring out the best that is in him, and to reap the reasonable reward due him; it is a struggle against monopoly, a thing abhorrent to the law, to justice and to reason; it is a struggle to maintain the constitution and the law which guarantee to every man the protection of his person, his liberty and his property; it is a struggle to maintain the right of personal ownership of property, upon which Civilization is based; it is a struggle to defeat robbery and the subjection of the mass to the arogant domination of an organized band seeking to grow fat upon the labors of others; it is, specifically, to protect the people of the whole country against the extortionate prices that they would be forced to pay for coal to cook their food and warm their bodies if the United Mine Workers of America gain absolute control of the production of coal, and to protect all industry against a domination that would force the people to pay greatly increased prices for all manufactured articles.

It is clear, I think, that we are fighting a battle for the good of all the people, and we, therefore, have the right to ask the sympathy and aid of every right-thinking, law-abiding, liberty-loving man, and I appeal to you, and, through you, to all with whom you came in contact, for sympathy and aid.

The Sovereignty of West Virginia has been challenged by open insurrection and warfare, but that challenge extends to all

government and to all law, by an oligarchy drunken with power, desperately seeking to remove the last obstacle in its way so that the people of the United States will be forced to bow in humble acquiescence to its will.

(The meeting adjourned at twelve-thirty.)

SPECIAL SESSION

Devoted to Discussion of Methods for Increasing Use of Metal Products

WEDNESDAY AFTERNOON, OCTOBER 19, 1921

The meeting was called to order at two-forty-five by Chairman W. J. Loring.

CHAIRMAN LORING: We have with us today Mr. Sidney J Jennings who will discuss a very important item on the silver question. Mr. Jennings is qualified as nobody else that I know to discuss this situation. I have great pleasure in introducing Mr. Sidney J. Jennings of the United States Smelting, Mining and Refining Company. (Applause.)

MR. SIDNEY J. JENNINGS: Mr. Chairman, Ladies and Gentlemen: In common with all other producers of metals, the miners who produce silver have, in the last few years, been casting about to find some means of increasing the use to which their metal could be put. In the past there have been three general directions in which silver has been used—in the use of silverware and jewelry, for photographic purposes, and its chief use, of course, money. It has been suggested by some of our English friends that research should be undertaken along the line of finding some alloy of silver which would preserve the brilliance of the metal when it was used as silverware, and at the same time permit of the housewife using it without cleaning it every time it is in use. This research has been going on for some time without really accomplishing the result aimed at, but it is a direction in which chemists, engineers and producers of silver can direct their attention, and I think with profitable results, probably.

Owing to the fact that a white metal used as jewelry shows up better on the dark skin of Eastern people than a yellow metal does, silver has from time immemorial been the preferred metal for adornment in India and China. This is evident by the enormous excess of imports of silver in those two countries over the exports which took place in recent years. For the two years ending December 30, 1920, India and China imported in excess of the amount of silver that they exported, practically the total production of the world for those two years. It was owing to the fact that the

United States Government had allowed a large measure of the silver that was stored in its Treasury in the form of silver dollars to be broken up and melted that permitted of this extraordinary use of silver in India and China.

Such a large absorption of silver in such a short period of time produced financial indigestion, and India has only at the present time succeeded in partially recovering from that effect. Instead of importing a normal amount of seventy to eighty million ounces, the last financial year India imported less than one million ounces in excess of the amount that they exported. It is on that account that the price of silver so rapidly declined after rising to the heights that it did in 1920.

The Chinaman has a way of exhibiting his wealth or storing his wealth that absorbs silver. Recent travelers in China told me that when the rich Chinaman wants to give himself a real treat, he has a column of silver some three feet in diameter and eight feet long cast and erected in his front yard. It fulfills the same object that a rich man in the United States fulfills when he buys an old master for a half million dollars. It satisfies the Chinaman, it excites the admiration of his friends and the envy of his enemies. He also has a greater safety in that when he desires to convert this exhibition of his wealth into purchasing power, the loss that he will sustain will probably be less than that of the rich American when he or his children desire to convert the old master into purchasing power.

I do not commend the ostentatiousness of the Chinaman, but I think the cultivation of a love for beautiful silverware will redound to the amenities of civilization and will help the silver miner.

In recent years, the rise and vogue of the movies has brought about a great and destructive use of silver. I tried to find or form some conception of the total amount of silver that is used in making film for movie photographs, but it has not been possible for me to do it with any degree of accuracy, although the probabilities are that it amounts to several million ounces a year. Of course, silver so used is not totally destroyed, because when a film is broken up and no longer in use, a certain small amount of silver can be recovered from the film; but so far the expense of recovering the silver has not proved sufficient to warrant its use in any large measure. The film industry actually destroys and takes out of use from the world annually a large amount of silver.

The increase in the use of silver in silverware, jewelry and photography is sure, but unfortunately it is slow. It depends in large measure for the increase of wealth generally, for the increase of population, and the increase of lighting for the movies.

It is the third way in which silver is used—that is for money—that seems to present possibilities that should be explored to their utmost limit.

I approach the subject of money with a great deal of diffidence. I have the equipment of an engineer, not that of an economist, but it seems to me that an engineer who has read and meditated a large number of hours on this subject may bring to the consideration of this problem some fresh views in a different way or from a different point of view than that usually taken by the economist.

The one thing that impersses me in reading the history of money from the time that such histories have been written, is the fact that all wise writers arrive at the conclusion that sound money is an essential. By sound money they mean money which when struck on a counter will emit a sound. In other words, a metallic currency, or some form of paper money which at the will of the possessor can be translated into sound money which will possess a brilliant value equivalent to its face value.

Now we have arrived at the phrase which most often occurs in the discussions of economists, and that is "value." When you try to arrive at what these gentlemen mean by value, you get a great variety of opinion. Personally, it seems to me that the ultimate basis of value is the emotion aroused in the person who possesses the thing valued by its possession. I may possibly illustrate my meaning by telling you a little story of an English friend of mine, a Mr. Van Ziddert, who possessed a painting of his grandmother by Sir Joshua Reynolds. It was a beautiful painting; it hung in his dining room and adorned that room greatly. A collector of paintings in Paris, Mr. Rudolph Kahn, had heard of this painting and desired to possess it. He later sent an agent to Mr. Van Ziddert, who said, "I have been empowered by a client who desires to possess the painting you have in your dining room to offer you a thousand pounds for it." Mr. Van Ziddert said, "That is nonsense! A thousand pounds for that painting of my dear grandmother? Absurd! I wouldn't think of it!" The agent went away, reported his ill success, and after a while came back and said to Mr. Van Ziddert, "My client is really very desirous of purchasing that paint-

ing, and I am empowered to offer you five thousand pounds for it."

"No," said Mr. Van Ziddert, "I couldn't think of parting with the portrait of my grandmother—dear old lady! She often dandled me on her knees; I have many recollections which are aroused in me every time I gaze at her dear face. No, I couldn't think of parting with that portrait for five thousand pounds." The agent went to Mr. Kahn and reported again his ill success and returned and said to Mr. Van Ziddert, "My client is still desirous of possessing your picture, and has empowered me to offer you ten thousand pounds." Mr. Van Ziddert said, "Dear old grandmother! The contemplation of your face has aroused in me many cherished emotions, but so will ten thousand pounds. You can have the picture." (Laughter.)

It was the emotion that was aroused in the gentlemen by ten thousand pounds that balanced the emotion that was aroused in him by the possession of the picture. And so it seems to me in all things that you can no more have a value to a thing without having somebody who has a desire to possess it than you can have a sound without somebody to hear it.

The economists say that the value of money is measured by the price of the commodities that you exchange for it. In other words, when the price of commodities goes up, the value of money goes down, and conversely. If we look at the course of the price of commodities in the last few years, we see that they have gone up as measured in returns of gold—very much indeed. And if we look at the price of silver measured in terms of gold, we find that it also has gone up, but not in such measure as the price of the twenty or thirty basic commodities that are generally used as index figures. In other words, if the basis of value had been silver instead of gold, the prices of commodities would not have reached such high proportionate figures as they have done in the last few years. Few of us have realized that gold as a standard of value is of recent occurrence. Previous to the year 1816, when it was officially adopted as the basis of value in England, no large country had gold as a basis of value. Silver was the basis of value and gold was looked upon as a commodity to be purchased and to be used as a storage reservoir in which you could conveniently pile value of labor.

It is only since 1873 when silver was demonetized in Germany

that the last great European nation officially adopted gold as its standard of value.

The question that many of the European economists are at the present time asking themselves is, "If the price of commodities would not have gone so high if silver had been used as the basis of value in the past few years, would the price of commodities in the future have gone as low as they undoubtedly will if gold remains the standard of value, if silver was used to replace it."

If we take a survey of the circulating medium now used in Central Europe, we see a circumstance or circumstances which have happened several times in the history of the world when fiat money has been attempted to be used as a circulating medium.

One of the most instructive of these uses was that which obtained during the French Revolution when enormous payments of assignats were issued which were founded on the lands which were taken by the French Republic from the Church. The first issue of this money bore interest at the rate of three per cent a year with the coupons attached. It was to be used in the purchase of the land by the people holding it, and it was hoped by the French statesman who authorized the issue, that they would by this means place upon the Church lands a large number of people who would be republican in sentiment and feeling.

The first issue of paper money was accomplished with great difficulty, but each succeeding issue was accomplished with less difficulty. The arguments that were used for the purpose of convincing legislators of the necessity for issuing further paper money speeded up, and the issue increased with the accelerating force of graft, until in 1796 the total amount of paper money issued was thirty-six billions of francs, and the value of paper money had fallen so that it took two hundred and thirty-two paper francs to buy one gold franc. When that occurred, the workmen of France said, "Nothing doing! We do not propose to work and be paid in a circulating medium, the purchasing power of which when we do our work is so much and when we get our pay is ten or fifteen per cent less."

The paper money was burnt; metallic currency appeared slowly at first, and with greater rapidity later, so that in one year after the burning of the paper money, commerce was re-established and a metallic circulating medium took place.

Similar experience has been gone through in Mexico within

recent years and to my own knowledge. The paper peso issued by the different revolutionary governments of Mexico sank to such a value that it took fifty paper pesos to buy one silver peso, and when that issue was current the workmen of Mexico refused to work for paper money. The government issued a decree that on a certain day in November, 1917, all wages would have to be paid in metallic currency. Our men threw up their hands and said, "Why, we haven't seen any metallic currency for eighteen months! There isn't any!" All to no avail. The government said, "You have to pay because the men won't work," and by using the merchants of the town who had been carrying the workmen for some time and to whom the workmen owed bills and by telling the workmen, as soon as they were paid metallic currency, to take it to the merchant and pay their bills, we in turn bought that metallic currency from the merchant by drafts on New York, and we were able to make one particular set of metallic currency perform a very rapid duty in paying debts and paying wages.

Now if you have observed the fall in the value of the mark in Germany as measured in gold, you will see that today it is closely approximating fifty paper marks to one gold mark. The question that arises in the minds of many is, will the German workman be more patient than the Mexican, will he wait until his paper mark falls as far as the French franc did, or as far as the Austrian crown has? We see occasional spurts of business in Germany in which the workman who has received paper marks tries to spend them all in order to acquire goods or pleasures before his paper money has no value. The continued issue of paper money in Germany impresses me as being the legalized robbery of the enthusiastic and the patriotic by the keen and cold-hearted. That can only go on for a limited further period, in my opinion.

The United States, at the present time, possesses roughly forty per cent of the gold that is used for monetary purposes in the world. The nations of Europe owe the United States with interest something over $10,000,000,000. The countries of Europe desire to and in all probability will pay their debts, but it is in the power of the United States to put on as much pressure as the directing statesmen of this country desires in order to reduce the prices of commodities as measured in gold in Europe; for it is perfectly easy to see that the amount of gold that the European countries can use to pay their debts is limited and that they will have to pay

these debts in commodities or labor. And the United States can say at each offer of commodities or labor, "That isn't enough for my dollar. I want more labor or I want more commodities."

I think the statesmen of Europe appreciate this position as much as or as well as the statesmen of the United States, and in trying to see how they can get out of this awkward position—this dangerous position, they may see that the door of silver is an easier one to open than the door of gold. (Applause.)

(Mr. Edwin Ludlow, President of the American Institute of Mining and Metallurgical Engineers, took the chair.)

CHAIRMAN LUDLOW: Is there any discussion on this paper? If not, we will go on to the next paper, which will be on "Copper, a Metal of Commerce," by Mr. Thomas D'Arcy Brophy of the Anaconda Copper Company. (Applause.)

MR. THOMAS D'ARCY BROPHY: Mr. Chairman, Ladies and Gentlemen: When the Santa Maria arrived off the coast of Honduras, Columbus captured a native canoe, and among other things it contained a number of copper hatchets. After reaching a point near Panama, he wrote a report to his sovereign, and in mentioning the incident he spoke of these and other excellent samples of the art done by the natives. He further added that he believed the country contained great mines of copper.

Almost from that day forward, the mining of copper ore and the fabrication of copper metal have been industries in this country, and important ones Early American discoverers all commented upon the extensive use of copper by the native Indians, and the extreme cunning with which they made their domestic utensils as well as ornaments and implements of war.

With such evidence of the use of copper before them, it was quite natural that the early colonists should adapt the use of copper to their domestic requirements, particularly in view of the extensive use of the metal in old Europe. Thus we find that the art of working copper is among the first of the major arts or the major industries to be developed in the colonies.

In 1645, Joseph Jenks, a native of Hammersmith, near London, came to Massachusetts as chief mechanic and workman for John Winthrop, Jr., and he deserves to be held in perpetual remembrance in American history as being the first founder who worked in copper and brass on the Western Continent.

Three years later, Governor Endicott discovered copper deposits and brought smelters and refiners from Sweden and Germany.

With the discovery of additional copper deposits in Pennsylvania, New Jersey, and Virginia, and the establishment of rolling mills in Boston, New York and Baltimore, the development of the industry was rapidly made, and in the middle of the last century we find copper or its alloys in general use for cooking utensils of all kinds, roofing, ornamental ware, and a thousand other uses ranging from the manufacture of pins to the sheating of ships. Except for that part of the country's production which was exported, the entire supply was used for purposes which we may broadly term domestic.

With the advent of the general use of electricity, the demand for copper jumped enormously. The production of the country was totally inadequate to meet the demand, the price rose rapidly, and it became increasingly difficult for manufacturers using copper for domestic purposes to secure an adequate supply.

The development of the electrical industry continued at an astounding rate, and the consequent demand for copper was very great. A series of wars further complicated the situation by unusual demands for munition purposes. Great new copper deposits were discovered, new mines were opened up, improved mining and smelting methods were developed, but still the production was inadequate to meet the demands, and much of the metal which had hitherto been used for domestic purposes was diverted to these new uses.

Because of increased costs, manufacturers cut out copper wherever possible and the use of the metal for domestic purposes was seriously curtailed. The result was that hundreds of substitutes appeared on the market, claiming all the virtues of copper and selling at a considerably lower price. The pretentions of these inferior products were allowed to go unchallenged and gradually the idea became firmly fixed in the minds of the buying public that copper was not only too costly for ordinary domestic uses, but that the advantages of copper were greatly over-rated and not worth the difference in price.

With the coming of the World War, the demand for copper became so great that its use in all but essential industries was expressly prohibited. The manufacturers of substitutes were quick to seize

this opportunity of becoming even more firmly entrenched in fields formerly dominated by copper, and intensive advertising and intelligent sales promotion work resulted in the successful marketing of these products. Numerous tar and asbestos roofing materials appeared on the market and copper roofing gradually disappeared from use. Today a copper roof is almost a rarity and this important market which formerly consumed an enormous tonnage has been practically abandoned.

In 1909, aluminum kitchen utensils were practically unknown. An effort had been made to market them some years previous, but it had been entirely unsuccessful, so much so, in fact, that aluminum was commonly known among the retail hardware dealers as "lemon metal." The absence of competition in copper stimulated manufacturers of aluminum ware to greater effort, and by improving their product and by an aggressive campaign of publicity, the use of aluminum kitchen utensils has increased by leaps and bounds until today fifty per cent of the kitchen utensils used in this country are made of aluminum, while less than six per cent are of copper.

In 1912 the average amount of copper and copper alloys used in automobiles of American manufacture was two hundred and forty pounds per car. Today the average is less than twenty pounds per car. In 1914 the largest manufacturers of screws, nuts, bolts, etc., consumed ten million pounds of brass. Last year they used less than three million pounds. The superiority of brass for piping, especially for hot water supply, is unquestioned. Yet today brass represents only a small percentage of the total outlay for plumbing, even in our finest buildings. The plumbing in the Commodore Hotel in New York cost $900,000, of which $3,150 represented brass piping. The plumbing in the Woolworth Building cost $450,000, of which only $32,400 went for brass pipe. And so we find it through all the industries. Plastic materials, such as the people believe better than copper, are substituted for copper in roofing, iron substituted for brass in plumbing, and steel for both copper and brass in automobiles.

This condition was not primarily due to the World War, but to neglect in times of prosperity of these important consuming markets. During that amazing period when the demand for copper far exceeded the supply, no effort was made to protect the established markets upon which copper had so long depended, and the education of the public on the merits of copper had been entirely ne-

glected, in the face of the most vigorous campaigns on the part of manufacturers of substitutes. The result was that copper came back from the war to find hundreds of substitutes firmly established and a profound public ignorance of the merits of copper and brass.

Brass plated hardware, a product of war-time emergency, continued to find favor, and when it rusted the reputation of brass suffered. A prominent architect told me recently that not one person in a hundred realized even remotely the advantages of copper and brass. Manufacturers continued to turn out the cheaper product. Dealers frequently preferred to handle the more profitable substitute, and architects, builders, plumbers, and roofers faced with the necessity of keeping building costs down, oftentimes discouraged the use of copper and brass because of the higher initial cost, although most architects prefer to specify copper and brass as a matter of professional pride.

A recent canvass of architects in and around New York developed the fact that one hundred and thirty-seven out of one hundred and fifty interviewed recommended copper as the best roofing material obtainable; one hundred and forty-one recommended copper for flashing and downspouts, and one hundred and twenty-eight recommended the exclusive use of brass pipe. Architects generally would gladly use copper is prospective builders understood the rare and exclusive qualities of the metal and would be willing to bear the extra expense.

Sheet copper is the best roofing material known, being very light, absolutely impervious to the action of the elements, and practically everlasting. It is capable of being laid flat or being worked to any curve, and after being in use a short time it takes on a most attractive color which harmonizes with practically all building materials.

The first cost of copper roofing is greater than that of some other materials, but over a period of years copper, with practically no maintenance costs, is considerably less expensive than any other material, and if a copper roof is properly erected it should last practically forever.

There are thousands of examples of copper roofs in service in all parts of the world. Nagoya Temple in Japan was roofed with copper five hundred and ten years ago, and it is today in perfect condition. Its many gabled roofs covered with the green patina of age have taken an added beauty with each succeeding year. The

State House in Boston has a dome roofed with copper; it was roofed in 1831 and is still in excellent condition after ninety years' service and exposure to the rigors of the New England climate. Christ Church, Philadelphia, has a copper roof laid in 1838, and I was recently informed that there is every reason to believe that the roof is good for another hundred years at least.

There are hundreds of less conspicuous examples of the wisdom of roofing with copper in the older sections of the country, yet copper is rarely specified because of a slightly higher initial cost which is saved many times over in the first few years of service.

For other roofing materials or for other roofing purposes, such as flashing, gutters, and conductors, copper is unequaled. On the Chew mansion in Germantown, Pennsylvania, one of the rain conductors bears the date of 1798. It has been estimated that an average of four hundred feet of gutter and conductor pipe are used on the typical American dwelling. Made of copper, it would cost less than $200—a small item in the total cost of building a home, yet over ninety per cent of the spouting used is made of galvanized iron which must be replaced at intervals of not over five years, while copper will last a life-time.

The cost of erecting copper and galvanized iron is substantially the same, and the difference in the initial cost is absorbed before the first replacement of galvanized iron is completed.

The use of copper in ship-building is as old as the industry itself. The ancients used it extensively, and modern ingenuity has devised nothing better. Paul Revere sheathed the sides of the Constitution with copper in 1803, and only last May the old frigate "Granite State," having completed seventy-five years of service in the American Navy, was burned at the water's edge in order that the charred hulk might be stripped of a copper bottom and the brass spikes in her hull reclaimed.

Lightning conductors which we owe to the genius of Franklin have been given an evil reputation by fakers and confidence men, but the fire losses of this country due to lightning are enormous. The Department of Agriculture is constantly urging the use of lightning conductors, and fire insurance companies allow reduced rates on buildings so protected, yet this industry has been allowed to languish and become the prey of shysters.

What copper and brass need is publicity. If you will pardon the colloquialism, we should "tell the world." Where resistance to

corrosion, easy handling of expansion and contraction, absence of upkeep expense, and long life are to be desired, copper is supreme.

My purpose is not to detract from the merits of other metals; they all have their uses, but there are certain fields in which copper excells, and we intend to do all in our power to restore the metal to its former position of dominance.

In the kitchen utensil field copper has marked points of superiority. In heat conductivity it is vastly superior to aluminum, and in a copper utensil food is cooked uniformly on the bottom and sides of the vessel. Fats and greases are not absorbed and consequently it is easy to keep the utensil clean. Food flavors are retained, and copper utensils are and always have been the choice of the world's greatest cooks.

If the home builder knows that by using brass his plumbing troubles are solved, he will not hesitate to spend the few additional dollars to insure himself of this comfort. Brass and bronze hardware can always compete successfully with plated steel substitutes if the prospective purchaser knows that brass and bronze will outlive the building itself and all that stands between steel and rust is a thin veneer.

The automobile industry will return to brass when the buying public has taught itself or has been taught to demand quality where it cannot be seen but counts the most. Copper roofing can be revived if the merits of copper are known. Brass plated screws can be no longer offered as solid brass when the consumer is taught to demand the best. Electrical expansion and a revival of export trade will probably bring back a normal demand in the copper industry. But copper must get back in domestic commerce if the industry is to be stabilized and protected against constantly reoccurring over-production. The output of our rolling mills in 1919 was seven hundred million pounds. The domestic consumption of copper can be greatly increased by a campaign of public education. Let us revive the latent interest of the public in copper and restore the metal to its rightful place as an important factor in the domestic life of the country.

In conclusion, may I point out the significant fact that large increases in copper production have always been created not by any great effort within the industry itself, but by some influence from the outside. The development of the electrical industry, the Spanish-American War, the Boer War, the Russo-Japanese War, the

extension of telephone and street railway system, the development of the automobile industry, and lastly the World War, are responsible for the increase in the production of copper from three hundred and eighty million pounds in 1895, to two billion, five hundred million pounds in 1918.

During this period of constantly increasing production, the copper industry has not even protected the markets upon which it formerly relied. The war emergency is over, copper production is more than equal to the demand, and now is the time for a great effort within the industry itself to recover for copper, brass and bronze their rightful places in domestic markets which during the war were usurped by inferior substitutes. (Applause.)

CHAIRMAN LUDLOW: I would like to say in discussing this matter myself from one point of view, that it was the subject of a discussion at the New York Section of Mining Engineers, and the feature was brought out that copper was not being sold at a price for the arts and for the uses where it was used at a competitive price compared to its first cost. A copper boiler, for example, which everybody acknowledges is much better of copper than of iron, you are told, if you inquire, is worth about $15.00. The actual difference in cost of material is only about $3.00, and it was to get at the reason for that that an investigation was made, and it was found that it was because the producers of copper did not deal directly enough with the trade. There were too many intermediate profits that had to be taken before the copper in its form of either boiler, roofing, or water-spouting, was able to reach the ultimate consumer, and that added a very large percentage to its cost. It was strongly recommended that the manufacturer of copper should go and take a lesson from the zinc man and from the aluminum man and go directly to the trade and by placing his copper at a price represented by the quality of the material itself, he would soon win back his position, which every one acknowledges, because it is known that copper is the best metal for roofing and for water-spouting and boilers and all of that domestic stuff.

Now we will have the next paper, "The Commercial Future of Copper, Brass and Bronze," by Capt. Harry George of the Chase Metal Works, Waterbury, Conn. (Applause.)

CAPT. HARRY GEORGE: Mr. Chairman, Ladies and Gentlemen: With profound appreciation I accept this privilege of saying a few words to the Mining Congress on the Commercial Future of

Copper, Brass and Bronze. During a career in the Navy I was fortunate in being assigned to several shipyards and for two years held the responsible post of general inspector of electrical equipment. This service placed me in touch with engineers of acknowledged merit and reputation and gave me a practical insight into the physical characteristics of many of the materials of engineering. On retiring from active service I became a prospector and gold miner in Alaska, a potent reason why I am glad to be here.

I then became associated with the Chase Metal Works, Waterbury, Conn., in the Sales Department. During the World War I was recalled to active duty and ordered by the Navy Department as Commandant of the Navy Yard, Mare Island, California. On the conclusion of hostilities I rejoined the Chase Metal Works as Superintendent of Research.

Copper, brass and bronze have been held from time immemorial in high esteem wherever strength, easy working qualities and resistance to corrosion are essential. Within a comparatively few years the appearance of cheaper and inferior metals has resulted in their use through a false conception of economy based only on a lower first cost. Unfortunately there has been little effort on the part of copper and brass producers and manufacturers to withstand this invasion. This situation began before the World War and developed rapidly during hostilities on account of the scarcity of the non-ferrous metals and the absolute necessity of using other materials. Ingenious advertising and aggressive promotion have been weighty factors in this development. Claims have been made that many of the ferrous alloys are distinctly superior to the non-ferrous in endurance, notwithstanding the concensus of competent technical opinion to the contrary. There has been nothing adduced to substantiate these claims either in theory or practice and they rest not on the dictum of engineers but on clever advertising. Copper and brass have been in favor for a variety of purposes for so many years that a concerted effort to protect them from the inroads of newer and inferior substitutes has as yet scarcely been actively considered. In the construction of locomotives the relative weights of bearing metals, copper and brass pipe, locks, valves, etc., has been slightly reduced during the past twenty years. Specifications for most foreign locomotives require copper or brass for boiler tubes and stay bolts, and in many cases for fire boxes also. The English practice inclines to copper while brass is largely used on Australian and South Ameri-

can lines. Copper tubes have been used even in flue heaters with economy and success. The use of copper tubes instead of steel insures not only a longer life, but also that the locomotive expends less of its active career in the shop undergoing retubing and the stoppage of leaks. In these days of high fuel costs, high transportation rates, high wages and high general operating expenses every economy should be introduced in railway management by the employment of only the most efficient materials.

The life of a locomotive copper boiler tube is estimated at about three times that of steel. An English railway authority claims that a life of from 240,000 to 360,000 miles is obtained with copper tubes as against 80,000 to 120,000 miles for steel. In addition to this we have the higher heat conductivity of copper and a scrap recovery value of old tubing much higher relative to the original cost than the scrap value of steel. We are entering upon a new era of industry and the broad field of aggressive International competition. If we are to succeed it is imperative that the utmost economy be practiced from the humblest worker to the chief executive. We talk glibly of the supreme necessity of thrift in the individual—what America most needs is thrift in industry.

The metallurgical staff of one of the prominent manufacturers of copper bearing sheet steel (containing not more than 0.25% copper) debates in the transactions of the American Electro-Chemical Society with the Research Department of an open-hearth steel company as to which product is the more resistant to corrosion. As a matter of fact sheet copper under similar conditions is many times more resistant than either.

Mr. D. M. Buck, Metallurgical Engineer of the American Sheet & Tin Plate Co. in these transactions states as follows: "By adding small amounts of copper (approximately 0.2%) to steel and iron the corrosion rate under conditions where the product is alternately wet and dry is tremendously reduced." A paper by Messrs. Aupperle and Strickland, Chemists of the American Rolling Mill Co., says, "Samples alike in analysis except for copper content made from the same heats indicate that the Copper was responsible for the more rapid corrosion of the copper bearing sample. The copper was the only varying factor in the two grades of metal." This substantiates figures from their own experiments showing the relative resistance of open hearth iron and steel to copper bearing iron and steel as several times that of the latter. In an experiment which

approximated actual atmosphere conditions as closely as practicable in a laboratory E. D. Richardson in a paper read at the American Institute of Chemical Engineers found over a period of 1,000 hours that a sample of copper bearing iron was completely disintegrated and that another showed a corrosion of about 292 times that of copper under like conditions. An iron approximating in analysis that referred to by Aupperle and Strickland showed 212 times the corrosion of copper.

I quote the conflicting opinions to show that laboratory results should be accepted with caution and that the adaptability of a metal to any specific purpose can be determined only by actual use. The layman might naturally inquire why not use a greater copper content and profit by the well known resistance to corrosion of that metal, unaware of the fact that minor changes in composition often result in marked changes in physical characteristics and might place the metal or alloy outside the category of engineering materials, or he might ask why not use straight copper in the first instance and realize in full the known resistance to corrosion of that metal.

In the laboratory at the Chase Metal Works we have initialed a series of tests under varying conditions to determine the actual loss by corrosion to many of the best known ferrous and non-ferrous metals and alloys. The first series covers their resistance to a 1% solution of hydrochloric acid at atmospheric temperatures and shows that copper, brass and bronze have a considerably greater resistance to corrosion under these test conditions than have any of the irons, steels, special irons and steels subjected to the same test. It is our intention to continue these experiments under various conditions of attack. The action of corrosion may be retarded by a change of constituents or by covering the metal with some protective coating. These protective coatings involve a high maintenance charge and often fail to accomplish the desired object. Immunity from corrosion without such coatings is one of the most desirable features of copper, brass and bronze. Over a period of years the initial higher cost of these metals is small as compared with the annual outlay for the upkeep and repair of cheaper substitutes. Copper roofing as compared with ingot iron or galvanized iron over a period of 30 years, a conservative estimate for the longevity of copper, will show a marked saving. The longevity of copper from authentic records is about 10 times that of galvanized iron, and from 3 to 4 times that of ingot iron. Assuming that galvanized and ingot iron

will require painting every second year it can be readily deduced that for the 30 year period, using our car rent market prices that the relative cost of copper, ingot iron and galvanized iron will be in the ratio of 1, 2 and 6 showing a marked saving for copper on account of its superior endurance and extremely low costs of maintenance. Thirty years is a conservative estimate for the longevity of copper roofing and has frequently been exceeded.

The building industry consumes large quantities of copper and brass. In this important industry less of these metals is used than before the War and the mania for cheap materials without regard to upkeep and repairs are contributory causes. The producers and fabricators of copper and brass have assumed a passive attitude in the face of a strong and aggressive competition. Public ignorance as to the merits of engineering materials is wide spread and has never been corrected. Architects are in agreement concerning copper and brass and many of them instruct their clients as to what ultimate savings may be anticipated before specifying other materials. They are agreed that copper is the best of all materials for roofs and flashings and the same opinion is generally entertained by practical builders and sheet metal workers.

A prominent roofer states that copper is the best known material for all roofing purposes and has proved so over and over again, and that a roofer using copper knows that his work will endure and he is better off in reputation than if he had used a material which would disintegrate in a year or two. Cases where copper has failed have invariably been due to the faulty manufacture or to careless installation.

In the plumbing trade, brass is used for piping and there is also a large consumption for fixtures either plain or nickel plated. In the more expensive buildings high grade brass is specified especially for the hot water service, but in the low grade construction brass is frequently forced out by cheaper and less durable metals. The superiority of brass pipe is conceded by plumbers on account of the endurance and resistance to corrosion. There are innumerable instances on record where iron pipes after three or four years service have been found so filled with rust that an ordinary lead pencil could not be passed through them. This rust action which seems inevitable in iron pipe will cause leaks not only in the joints where the thread has decreased the thickness of the metal, but at other points

of structural weakness. Brass pipe has occasionally failed from "season cracking."

This defect is due to initial strains in the metal, a condition now understood by manufacturers and can be eliminated by a suitable relief anneal. In concealed piping where costs of repairs are necessarily heavy on account of tearing out walls and floors iron pipe should never be installed. It is interesting to observe how little the cost of brass pipe for plumbing affects the total cost of the entire plumbing job. The labor charges and cost of fixtures are practically the same in either iron or brass piping. In a large residence in which brass was to have been used throughout it was found that the substitution of iron for brass would only reduce the price of the entire plumbing job by about 2%. A construction company states that it has a house that cost fifteen thousand dollars six years ago. The installation of all brass pipe would have increased the cost by only $200. The same house today would cost $30,000, but the additional cost of all brass piping would not exceed $300, due to the smaller increase in the price of brass over pre war conditions.

I had the opportunity during the late war to compare the comparative endurance of brass pipe with ordinary iron piping. We were called upon to immediately construct barracks for 5,000 men. On account of the scarcity of brass, iron pipe was used, for wash rooms, bath rooms, laundries and other sanitary facilities. The iron piping gave no end of trouble and the leaks were a source of daily inconvenience and annoyance. The older barracks, built before the war and equipped with brass plumbing gave no trouble. The situation was aggravated by our having to use brackish water for many purposes on account of the shortage of potable water, a situation not uncommon in the United States. I have recently examined a number of relics from the battlefields of France. Articles of copper, brass and bronze are invariably in a good state of preservation, while iron and steel are badly pitted and corroded. The contract is particularly marked in a German cartridge case, of which the base is brass, but the cylindrical body has been pieced out with iron-sheet. The brass portions are in excellent condition whereas the iron is so corroded as to be practically worthless.

In the ship building industry, the world war lead to the substitution of brass and copper and bronze by less suitable materials.

The reconditioning of ships at the conclusion of hostilities demonstrates the inferiority of such substitutes. It is the universal opinion of shipbuilders that copper and brass by their endurance, and low cost of maintenance, more than conpensate for their higher first cost. Copper and brass sheathing is incomparably superior to other metals, and the superiority of copper for wood fastenings is proverbial. I have often been impressed by the excellent condition of sheathing, bolts, cleats and various desk fittings of copper and brass removed from old ships after years of wear and tear in an environment peculiarly condusive to corrosion. Naval bronze is used for so many purposes on board ship that it is impracticable to name them here, and nothing has approached this alloy for strength and non-corrodibility. Copper piping is used as a rule on steam and exhaust lines, high pressure air lines, in the flooding and drainage systems and other purposes where longevity under adverse conditions is of prime importance. Brass piping is used throughout in the hot and cold water systems and in the sanitary plumbing, and for efficiency outdistances all competitors. On shipboard the general conditions are more conducive to corrosion than in other installations. We have salt water to deal with, besides waste oils, ashes and adverse climatic conditions, poor ventilation and many other causes of deterioration.

For condenser tubes, brass stands pre-eminent. Muntz Metal has been used for years but the Admiralty Mixture is becoming general, particularly if the circulating water is contaminated, which is generally the case in our large seaports and centers of population. Exhaustive experiments by our Navy Department and by the Corrosion Committee of the British Institute of Metals show that no alloy that can be commercially drawn into tubing compares with this mixture. For stationary installations this alloy is becoming the standard and has supplanted Muntz Metal, especially where the conditions are most favorable to corrosion. For marine purposes materials must be strong, durable, and highly resistent to corrosion. Copper, brass and bronze admirably fulfill these requirements.

The environment in mining is apt to be more unfavorable to endurance than on shipboards. The presence of acids and alkalies impregnated by metallic salts, poor ventilation and excessive moisture demand a careful study by the Engineer in his

choice of materials. It is fair to assume that many of the materials for marine work would be found equally efficient in mining installations.

Of late years various alloys have superceded brass in miscellaneous hardware. Hardware should be permanent, and not subject to the frequent replacement and repairs. Nothing is more unsightly than the hardware we see every day, disfiguring paint work by excessive rust—doors hanging on the fragments of a hinge, padlocks closed by rust, staples gone, and many other indications of waste. There is a strong tendency to plate with brass, iron and steel hardware. I have no doubt that many consumers purchase these articles under the impression that they are getting solid brass, and are disappointed at the unsightly appearance which obtains when the plating wears away, and the bare iron or steel surfaces rapidly corrode. True economy would dictate solid brass in the first instance to insure a reasonable length of service and satisfaction to the consumer. In cooking utensils, copper has been supplanted by other metals in the lighter implements, but for heavy service such as ships, galleys, hotel kitchens and the candy and food industries, copper holds its own.

Before the war the automobile industry had always used a fair quantity of copper, brass and bronze. During hostilities on account of scarcity they were replaced by substitutes. Because of their cheapness the use of these substitutes has continued. Coincident with this substitution has been the enormous increase in the automobile repair business out of all proportion to the increase in the number of cars. The absence of copper products is particularly noticeable in the rapid deterioration of cars in cities where subjected to the corrosive influences of salt air, gases from industrial plants, the use of crude oils, and various dust laying compounds on roadways undoubtedly contribute to this result. The effort to keep prices down by the employment of cheap materials in structural and working parts is poor economy to the owner. It is reported that the American car which utilized in its construction the largest amount of copper and brass products had been acknowledged by European engineers as the best car in this country and during the war was the choice of one of the allied governments for high grade duty.

Although the legitimate field of copper and brass has been

encroached upon it is not due to the intrinsic superiority of other metals, but rather to the fact that copper and brass have been left to depend on their established merits whereas the newer competitors rely chiefly on a lower first cost. Brass, Copper and Bronze have as wide a field as ever before, and it is the object of this paper to arouse public attention to a condition, which if not rectified will result in a national economic loss. To combat the flooding of the market by cheap and unsuitable substitutes the copper and brass producers and fabricators should unite with the engineers in a campaign of public education to check this growing evil. It is not my intention to case discredit on any particular metal. All have their spheres of usefulness, but it is the duty of the technician to insist that none are diverted to undertakings for which they are clearly unsuitable from the viewpoint of ultimate economy after a prolonged service.

The commercial future of copper, brass and bronze is assured. It is confidently assented that both Engineers and Consumers will return to the policy of using only such materials that show by endurance a maximum return on the investment and will no longer be beguiled by the fetish of a lower first cost.

The meeting adjourned at four-ten p. m.

FOURTH GENERAL SESSION

THURSDAY MORNING, OCTOBER 20, 1921

The meeting was called to order at ten-thirty by President W. J. Loring.

CHAIRMAN LORING: Secretary Callbreath has some announcements to make.

SECRETARY CALLBREATH: I first want to apologize to the members as to the meeting place last night. It was scheduled for room 1120. I am not going to blame anybody else for not knowing. My understanding was that it was room A-24. Certain members assembled in room A-24 and certain other members in room 1120. By the misapprehension, we held the meeting in room A-24 and named the Nominating Committee. The Nominating Committee is named under the by-laws to select those whom they may recommend for directors during the ensuing three years. The names selected in that meeting whom I am sure would have been approved by those who were not present were Mr. Falcon Joslin of Seattle, Mr. J. C. Dick of Salt Lake, and Mr. C. W. Potts of Minnesota. Those three gentlemen are charged with the responsibility of selecting four candidates for the directorship and will report at a meeting at room 1124 at four-thirty this afternoon.

The first business in order is the introduction of resolutions. All resolutions must be introduced in writing, read by the Secretary, referred to the Resolutions Committee without debate. Different organizations within the Congress may prepare resolutions and approve them, but they must all be approved by the general Resolutions Committee before they are put before the convention and become the work of the convention.

I have one resolution.

Secretary Callbreath read Resolution No. 1 offered by the Gold Conference, which was referred to the Resolutions Committee.

CHAIRMAN LORING: Are there any other resolutions that are ready?

SECRETARY CALLBREATH: I know of a half dozen that are almost ready. Any of you having any matter that you think should have the endorsement of the Congress will kindly prepare your resolutions and introduce them at the earliest possible moment.

CHAIRMAN LORING: The subject of "The Coal Industry and the Public" will now be discussed by Mr. T. H. Watkins, President of the Pennsylvania Coal and Coke Company. (Applause.)

MR. THOMAS H. WATKINS: Mr. Chairman and Delegates: I think everyone will admit that my subject is a big one and that it can be, and is, approached from many different angles. The general public, or in other words the consumer has a point of view upon which the consumers as a class agree, i. e., that they want their coal when they want it, and they want it at a low price, and they want it clean.

Then, there is the miner and the labor leader; they would like steady work, but not too steady, and the fewer hours per day of steady work the better they are pleased; wages—of course they must be high and not subject to the economic conditions that surround other industries and workers.

Then, there are our politicians, or men in public life, our newspaper and magazine writers, men who as a rule know a little about every line of business, finance and industry who can tell you how the coal business should be conducted.

Then, we have the operator, the wholesaler, the jobber and the distributor—large and small. They have their point of view, and each one of these different groups holds different opinions as to how the coal business should be conducted in its relation to the public.

The coal industry and its relation to the public is a world problem, and affects all civilized nations. The great world war brought to the attention of all the thinking and reading people of the world in a manner never before realized, the importance of coal to our industrial nations. Germany could have damaged the coal mines of England as it did those of France, it would have won the war in a few months.

The Peace Conference found that one of its most difficult problems in settling future boundaries revolved around the coal deposits of Continental Europe, and it has yet to be determined whether it found a solution that will avoid future conflicts over the possession of certain coal fields.

The late war brought the coal industry of the United States into a prominence never before realized. Many people never gave a thought to the coal problem except as they were concerned in getting the needed supply to warm their homes. Little did they dream that it was the wonderful wealth of coal deposits scattered throughout

our broad land that furnished the basic foundation for the great development that this country has seen in the last two generations. Our great railroad systems, following our pioneers in the development of our natural resources, in the way of agriculture and minerals, could never have been successful without this blessing with which nature endowed this country.

Too little credit is given to the coal operator for his share in the wonderful development of this country—prospecting, exploring, drilling, digging and opening all over the land coal mines, and always in advance of the needs of the country, risking life and money in an enterprise requiring courage, intelligence and hard work, and taking the chances that go with all mining enterprises. It is seldom we hear a word of praise for the coal operator.

Among mining men such as compose the American Mining Congress we have a right to expect a sympathetic audience. The men engaged in mining gold, silver, copper, iron ore and other precious metals are, through their experience and knowledge, probably the only class of our people who understand and can appreciate the problems of the coal operator.

As I said before, the coal operator is always in advance of the demand. The productive capacity of the mines of the country has always been, when transportation was supplied, beyond the needs of the market, and the most satisfactory record in proof of this statement is the way that the mines of this country poured forth their product to meet the enormous increase in demand caused by the war. Record after record of production was beaten, and additional capital was poured in to increase productive capacity in case it should be needed as the war continued. If there was any stimulus needed to induce the coal operators of this country to put their heart and soul and money into the production of coal during the late war, that stimulus was furnished by the Honorable Francis S. Peabody, Chairman of the Illinois Committee on Arrangements, and the late Honorable Franklin K. Lane, then Secretary of the Interior. And it is with great satisfaction that I see Mr. Peabody and the other distinguished members of his Committee cooperating to make this, the Twenty-fourth Annual Convention of the American Mining Congress, an epoch-making one.

It is fitting that the coal section of the American Mining Congress should take an active part in its deliberations. All mining men have many interests in common and many problems that it is our duty to the public and ourselves to assist in solving.

The call to the coal operator reads:

"The representatives of the mining industry will meet in Chicago, October 17-22, to plan for prosperity.

"To plan for prosperity requires a careful analysis of the difficulties, a harmonizing of divergent opinions, and the formulation of a constructive program for which there can be united action. No single mine operator, no single division of the mining industry can in itself effectively solve the tremendous economic problems which confront the mining industries. Collective thought and cooperative effort are essential."

The call goes on to say:

"The coal industry has been a target for the public, the press and the politician. It may be a target toworrow as a result of conditions over which the operator has no control."

These statements are true notwithstanding the fact that the coal industry has been investigated and then again investigated by state and national legislators. Senator Reed, during the last Senatorial investigation, probably approached the subject with a desire to ascertain the facts and with less prejudice than any of the investigators that I have heard of. In a speech in the Senate of the United States on the coal problem, he said.

"According to the testimony. the mines of the country were increased from 5776 in the year 1913 to over 11,000 mines in the year 1920.

"The conclusions seem irresistible:

"(a) That the supply of coal is practically inexhaustible; that it is stored in the ground and will remain there free from destruction until it is removed by man and transported to the market.

"(b) What has been said of coal is true of no other product. The oil fields are apparently being rapidly exhausted; there is seemingly a limit to the amount of ores readily accessible to the miner's pick; but whatever the facts may be with reference to mineral deposits it is certainly true that of none of the things produced by man can it be declared that a time of shortage or famine may not come. To illustrate, no matter how much wheat is sown the crop may be a failure; corn and all cereals are subject to seasonal disasters live stock may be swept away by a plague none of these things can be stored or kept for a great length of time.

"(c) Bituminous coal, according to the evidence, has not been monopolized. And, as I have said, because of its wide distribution and widely scattered ownership, it will be very difficult, if not impossible, to ever bring it within monopolistic control.

We have, then, a condition which only demands that the coal

shall be taken from the ground and delivered to the people. If that is done at a fair and reasonable price, the problem is solved."

He went on to say, in regard to the question of prices and profiteering:

"The evidence, however, does not demonstrate that the profits were anything like as great as those gained in many other industries. While these increased profits had an effect upon the price of coal, nevertheless it was shown that the increase of profits was only one of the small elements contributing to the enormous advance in the price of coal."

Senator Reed's remarks apply to bituminous coal, and confirm my general statements. He said anthracite coal presents an entirely different problem.

The production of anthracite coal in 1920 was 89,100,000 tons.

The production of bituminous coal in 1920 was 556,563,000 tons.

Of this enormous production, only 39,214,809 tons were exported, including Canada which must always depend upon the United States for the great bulk of its coal supply.

England's production of coal in 1920 was 229,000,000 tons.

The production of coal for this year, owing to the general slump in business in all lines, is 115,000,000 tons short over the same period in 1920.

The causes of our great industrial depression are so varied, and have been so fully discussed and theorized upon, that I shall avoid discussion of them except as the handling of our coal problems affects the general situation. We are here to discuss and plan for prosperity. A policy based upon sound, fundamental, economic principles in the handling of our great coal industry is essential towards the restoration of present and permanent future prosperity and that policy, if found, must be based on justice and equity, or in other words, a square deal to all interests.

Directly concerned in the handling of the coal industry are three principals: the public, the operator and labor; it is immaterial which you mention first. They are all dependent one upon the other, each one of these groups more or less selfish, more or less ignorant in regard to what affects the other.

Let me briefly recall some of the outstanding experiences in connection with coal during the war period. Before this country's entrance into the war, you will all recall the demand for war munitions, food, lumber, etc., by the Allies. You will recall the congestion on the transportation lines of the country. The demand for

coal increased with the business activity, and when a shortage of cars for coal became threatening, many industries, with huge profits in sight, caring little for an additional dollar or two on the price of coal, commenced to bid for it, so that at the time of this country's entrance into the war there was an excited and panicky condition in the spot coal markets. The railroads, thought to be not functioning properly, were taken over by the government; a Fuel Administrator was appointed; coal prices were fixed, and fixed to start with upon figures of cost and realization that were from two to three years old, the result being that the prices fixed did not cover the cost of mining in many districts. Notwithstanding this, production continued to the capacity of the railroads to transport the coal. It took the Fuel Administration six months to get a faint idea of the problem that it was called upon to handle; the successful handling of it finally came about through the Fuel Administrator calling upon the practical coal men of the country to assist his Administration. The services of the National Coal Association were recognized by Dr. H. A. Garfield, Fuel Administrator, as invaluable. The coal men, through the organization of the National Coal Association, rendered the greatest service under the leadership of W. K. Field, followed by the able administrations of J. H. Wheelwright and Harry N. Taylor.

No industry was so drastically regulated as to prices as was the coal industry during the war. The problems were many and serious, both as to labor and transportation, but they were met, and an enormous accumulation of coal was on hand and in storage when the Armistice was declared.

Wages had been increased; freight rates had been increased, and yet coal was sold generally throughout the country and delivered at a lower price than in any other country on the face of the globe.

The real serious problems in connection with the coal industry and affecting the country at large, while developing during many years before the war, became more acute as a result of the war policies of our Administration, and broke out beyond control within a year after the Armistice.

I refer to two matters in particular. One, government regulation and handling of our transportation system; the other, the development and growth of union labor and its coddling by the previous administration.

On the matter of transportation, I shall but briefly touch. That subject is so well understood I believe by the general public, so far

as coal is concerned at least, that I need but call attention to one fact, i. e., that when transportation and cars were available at the mines, there was an abundant productive capacity at the mines to supply all the coal that was needed, provided the miners were not on strike.

The competition between producers in each district, and the competition between districts and states when transportation was available, has always kept the price of bituminous coal at a low level, and prior to the war at a level so low that approximately seventy-five per cent of the production was sold at a loss. If it were not for the fact that a great many of our industries are prostrate today, the railroads of our country would be unable to handle the fuel needed for normal consumption. There are over 150,000 out-of-order coal cars, in addition to 110,376 idle coal cars in order, and at this time last year there was a shortage of equipment. It is absolutely essential that our railroads should be made efficient, and yet we see their inability to procure funds at reasonable rates in order that they may be put in condition to meet the normal growth of our country needs.

The other matter is of vital importance, and one that the operator and miner and the public must come together on—and I say MUST because it is inconceivable that the prosperity of this country should be dependent upon the uncertainties and the unsatisfactory state of affairs that exists between labor and capital involved in the mining industry of this country. This is a problem; it always has been more or less, but never more acute than it is today, and never more menacing, not alone to the coal industry, but to the nation at large. The questions at issue are fundamental; they affect personal liberty and the rights of property and a solution must, and will, be found. If it cannot be found by the operator and the miner, it will be found by and through a profound public sentiment of whose judgment, when it is finally made aware of the issues at stake, I have no fear. I refer specifically to the union labor organization, known as the United Mine Workers of America, an organization founded about twenty-five years ago, which has gradually grown into such strength as to think it is able to defy our Laws, our Courts, and the Government itself, and is in the hands of leaders today who have apparently thrown to the winds all conservatism and all sense of responsibility to the public and to the employer. We see men of real ability in this organization discarding all sense of equity and ignoring all economic conditions, all principles of collective bargaining, all moral obligations to the employers with whom they have dealt in the past and, I

might say in a true sense, all obligations to those whom they are supposed to have intelligence enough to represent. We see them all engaged in a scramble for power through personal ambition for the control of an organization that can stop the life blood of the nation, different groups fighting one another, outdoing one another in radical demands, ignoring absolutely the heavy burden that the rest of the public is trying to carry, revising to consider the modification of a contract that was forced on the industry and on the country at large on the verge of the winter of 1919 by a national strike. We have seen the organization in convention at Indianapolis. We have heard of its internal conflicts. We hear it is going to frame up some demands to be presented to the operators of the country which will add to the cost 40 to 100%, but we hear nothing to indicate that it has a feeling of responsibility to the rest of the public at large. We see, from their public utterances, an absolute defiance of public opinion; the rest of the struggling, hard-working people of the country, the farmer, who outnumbers them more than fifteen to one, and other industrial workers, have met the issue in a broad and helpful spirit; the United Mine Workers —the greatest single organization of Labor in this country— standing alone, engaged in internal squabbles, with each faction still believing the organization as a whole is strong enough to defy all economic laws, all public opinion.

The Miners' Convention recently adjourned deciding to delay presenting their demands to the bituminous operators until next February. It may be that by that time these men, or some of them at least, may come to a sense of their responsibility to the rest of the public. There is no sign of it at this time. In their lust for power, not satisfied with the highest rate of pay of any labor in the United States, not satisfied with the wonderful improvement that has been made in their working and living conditions, these leaders cry for MORE! MORE! MORE! And now they want nationalization of the coal mines and nationalization of railroads. They want a six hour day. They want only five days a week of work.

In order to extend and complete their strangle-hold on the country, they have gone to Alabama: they have gone to West Virginia, where many of their organizers and sympathizers are in jail today charged with murder and other violations of law. Millions of dollars have been spent by them, and they reiterate their determination to unionize the mines of West Virginia and all other sections

not yet unionized. They are increasing their assessments on the union miners of the country in order to carry out this program. If, by any chance, they should secure this additional power, the public will be helpless until they are thrust aside, as they will inevitably be unless they abandon their vicious practises and their radical theories and come back to sane and wholesome methods of conducting a union labor organization within the law. We have seen capital curbed by our legislators when it went too far. We will see this labor organization curbed, in my judgment, through the force of public opinion and the fact that they cannot escape sharing with other classes the changes that occur in the economic conditions surrounding this country and the rest of the world. The defeat of their program is sure, but, in the meantime, what suffering will ensue—all unnecessary, all needless. The public of this country does not want the men who dig the coal, the men who work on the railroads, or in the factories, or on the farms to be pauperized, and there is no necessity for it; we are too great in our resources; have too much natural wealth. But have the operators' and the miners' leaders the common sense to meet this great question and solve it without a struggle which will add to the many complications which this country and the rest of the world have yet to face?

On November 1st, 1919, this powerful organization declared a national strike and called from their work all the union soft coal miners throughout the country. In violation of a contract, which had not yet expired, it stopped the mining of coal, dislocated business, threatened the country with freezing and starvation, ignored the injunctions obtained by our government, and forced a compromise through the appointment of a Presidential Commission by which it agreed to be bound, and in a few months thereafter violated that award, and forced another advance of $1.50 per day, which it still insists on retaining until April first of next year, then to ask for another increase.

Had it not been for the production of coal during the winter from the non-union mines of West Virginia, Alabama and other sections of the United States, whose coal was diverted into unnatural channels to relieve the dire necessities of regions not usually dependent upon those mines, no one can picture the misery that would have ensued, not considering the enormous financial loss actually resulting and the great addition to the already high cost of living.

The mine owners of West Virginia, Alabama, and various small sections of the country, who have resisted the encroachment of this organization in its efforts to organize their men, saved the country from a great disaster in the winter of 1919, and in their continued resistance are entitled to the support and sympathy of all law-abiding citizens of this country.

The Organized Mine Workers Convention at Indianapolis made a great show at disciplining leaders like Alexander Howat, and will try to pose before the public as standing for the sanctity of contrucks. It is rather late in this attempt to clean the slate, especially as the national organization has a record for repudiation of contracts which is not enviable, nor one that would command respect sufficient to induce others not yet unionized to enter into contracts with it.

The Associated Press reported that the Miners' Convention, although refusing to condemn the American Legion because of alleged strike-breaking activities of some of its members, adopted a committee report calling on Legion officials "to put their house in order." The action came after several delegates had appealed vehemently for the convention to go on record in unqualified condemnation of the legion. As a matter of fact, in many districts Locals have expelled members of the Legion from its organization, and have warned others that they must withdraw from the Legion or withdraw from the United Mine Workers' Organization. This policy is in line with the consistent record of this organization to oppose all law-enforcing organizations, whether they be state militia, whether they be state constabulary, or local police, whose duty it is to enforce order and protect property.

The preamble of the Constitution of the American Legion reads as follows:

> "For God and country we associate ouselves together for the following purposes: To uphold and defend the Constitution of the United States of America, to maintain law and order; to foster and perpetuate a one hundred per cent Americanism; to preserve the memories and incidents of our association in the Great War; to inculcate a sense of individual obligation to the community, state and nation; to combat the autocracy of both the classes and the masses; to make right the master of might; to promote peace and good-will on earth; to safeguard and transmit to posterity the principles of justice, freedom and democracy; to consecrate and sanctify our comradeship by our devotion to mutual helpfulness."

This organization's condemnation of the American Legion cannot be understood except on the ground that it as an organization is opposed to all organizations which believe in the maintenance of law and order. It is astounding to me that our great newspaper writers do not burst forth in a spirit of indignation against the principles this organization is inculcating. Many of the foreign-born citizens and workers of this country get their whole idea of our form of government in and through the preachings of the leaders of this organization, and it is not to be wondered at that they follow such leadership when operators, business men and the public generally ignore their false and vicious teaching.

One of the most astonishing actions of the convention recently adjourned is the appointment of the radical, irresponsible, law-defying Alexander Howat to represent the United Mine Workers of this country in the International Conference of miners to be held in England next year. They rebuke him in convention for violating contracts and calling unwarranted strikes, and yet following that, honor him and make him a representative of the miners of this country. Surely the conservative, intelligent miners of the country —and there are many of them—cannot be in sympathy with the appointment of such a disreputable representative.

It is the old story over again—power, more power, then abuse of power—until finally the people rise in their strength to destroy any organization, whether of capital, labor, king or kaiser, which attempts to exercise autocratic control, ignoring property rights, freedom of contracts within the law and personal liberty.

England, once supreme in the industrial world, through its wonderful coal supplies, has seen its initiative destroyed and its business going to other nations through the domination of a labor union which secured absolute control of production and working conditions around the mines. Restrictive policies prevented the installation of improvements that would increase efficiency, until the very foundation of the British Empire were threatened by the great coal strike of the early part of this year. A solution there has not yet been found, and it will not be found, in my judgment, until the principles upon which their union is working have been discarded.

The men of Germany are working and flooding the markets with coal. The English mines are working but short time due to lack of markets, and were it not for the government subsidies, England could not compete with either Germany or the United States in the

export markets of the world. Yet if some of the leaders of the United Mine Workers had their way, they would throttle the development of the United States and put all miners in a privileged class, increasing the cost of coal, increasing the cost of all commodities and, by nationalization of the mines, pave the way for the condition that Russia finds itself in today. Work and thrift do not appear in any of their propaganda; their only cry is more pay and shorter hours. They have succeeded in breaking the contact between the members of their organization and their employers. Any attempt to bring about wholesome relations by a better understanding of the other's problems through mine committee work, through cooperative effort to better living conditions, to make a better community life, are immediately frowned upon by the leaders of the organization. Welfare work is called Hellfare work, paternalism, all because the leaders recognize that a closer and more human contact between employer and employe would destroy their opportunity for hunting up grievances, which is their capital.

For this condition the miners or the leaders are not alone to blame. I think it might be truthfully stated that the operators are more to blame. It is natural for all classes to follow leaders, and the miners have had theirs. But where have been the operators' leaders? For twenty-five years the operators' policy seems to have been one of following the path of least resistance, and in the earlier days of this organization, with miners' wages brought, through competition, to an unreasonablly low point, operators competing with one another through periods of over-production, many operators seemed to think that the encouragement of this organization would help to stabilize business in the production of bituminous coal through a uniform wage scale, and in order to insure the union's leaders strength to carry out contracts entered into on the principle of collective bargaining between the organization and operators, there was instituted a system called the check-off. The very plausible argument was used by the miners' leaders, in which the operators acquiesced, that in order to insure the faithful performance of their wage agreements it would be necessary, owing to the class of men they represented, to organize the whole force, and in order to secure the expenses of their organization and insure a sufficient revenue, a system of collecting the dues by the operator directly from the pay envelope of the men employed was instituted. I cannot believe that the operators in those days realized that they

were doing, and to what it would lead. No other organization of employers in the world ever adopted this system. Other labor unions were built up and depended upon the voluntary payment of the dues to their own officers, but this organization depends upon the employers collecting the dues from all members of the organization from the pay envelope semi-monthly. This money is collected and turned over to the officers of the union. The money is then used for propaganda, for organizers and for conducting and supporting strikes, and it is through the operators' assistance that the millions of dollars that have been spent in West Virginia, Alabama, and other sections of the country, have been collected. So they have succeeded in securing the closed shop, with the assistance of the operators dealing with the union.

The operator collects annually from each member of the union in my district in Central Pennsylvania $36.39, which is turned over to the treasury of the United Mine Workers of America. There are in the neighborhood of 500,000 members of this union, and we can readily figure the millions that are collected, and will be collected, so long as this pernicious system is continued. Every operator who participates in it is assisting in a conspiracy to help unionize every mine in this country, and is also assisting in collecting money to carry on the propaganda to nationalize the coal mines and to take his property and his business away from him. Many men not engaged in the coal business are astonished when this statement of fact is made to them, but the public generally does not understand that we, as union operators, are participants in this vicious and damnable scheme.

A union that cannot exist on its own merits, on the voluntary payment of its dues by its members should not be allowed to function in this land of free and equal opportunity to all. So, I say, the operators are to blame, and are helping to carry forward the menace to our institutions that I believe surrounds the present policy of the United Mine Workers of Workers.

A small, but influential group of operators in Illinois, Indiana, Ohio and Western Pennsylvania compose what has been known in the past as the Central Competitive Field. It is this group that has for years made the basic agreements upon which wages and working conditions are supposed to be settled. The rest of the districts throughout the United States which deal with union labor must wait until this group has made its agreement with the

United Mine Workers, and have to adopt the principles and general basic scale agreed upon. Conditions may vary as to markets, physical conditions and living conditions, but the operators of the outlying districts must either succumb to the dictation of that scale agreement or fight, so that you find today in all of the outlying districts a definite growing opposition to the practices of the past. The check-off and the closed shop come out of these scale agreements, and the time is not far distant, in my judgment, when there will have to be a new deal, a new arrangement, one based on a wholesome recognition of the rights of labor, one based on the rights of the public, and one based on the rights of capital employed in this great industry.

The failure of the operators to recognize where these scale agreements were bringing the industry to is largely attributable to the fact that their interests are so scattered and diversified that they are not acquainted with conditions in other districts, and it was probably not until the great war that operators from Kansas knew any operators in Pennsylvania. Pennsylvania operators did not know the men of West Virginia, Ohio operators did not know the men of Alabama; West Virginia operators did not know the men of Illinois. The first great gathering of the operators of this country came during our war emergency, when Mr. Peabody invited them from all sections of the United States to meet in Washington. That was a remarkable gathering, in which men from various states made the acquaintance of one another, and a great step forward was made in the better understanding of the problems that each district had to confront.

Through the National Coal Association that acquaintanceship has been further developed, so that today the operators of the United States understand each other and their different problems better than ever before in their history. It is in this fact that I see encouragement for the future. The antagonism between the operators of Pennsylvania and West Virginia, which grew out of the natural competition of the districts, is fast disappearing, and I believe this is so throughout the country. Out of all these experiences has grown a better realization of the responsibility of operators to the public at large and to labor, and a gradual acknowledgment that this great industry should be stabilized; strikes must be avoided; coal should be supplied; ruthless competition deplored; excessive prices deprecated; speculative

agencies in the distribution of coal, discouraged and finally eliminated.

I do not claim that better acquaintance has improved conditions, but there is a deep-seated conviction in the minds of men who did not hold such convictions a few years ago, that they must get together and work together in their own interests, in the interest of the public and in the interest of labor towards the stabilization of the business, the economical and efficient production of coal, and a knowledge of their responsibility in that they should not participate in the taking advantage of the public in the way of exorbitant prices in times of coal scarcity.

There is just as much danger to the interests of the nation as a whole in cut-throat competition and in selling coal below cost as there is in exorbitant prices. The inevitable effect of cut-throat competition, selling coal below cost, and bidding for each other's customers, is to produce a condition of unrest back at the mines, where the labor lives, through atempts to unduly reduce wages, which should have fair remuneration on fairly uniform working time.

We are experiencing at this time the efforts of some operators and some wholesalers to place 100 per cent, of product when there is only 60 per cent of demand. The restlessness, which is natural when mines are not working at their capacity, to secure business from somebody else is productive of a great deal of harm as, for instance, today we have in nearly all of our markets spot coal offered and sold at a price which is below the cost of production. Contracts cannot be made at these figures, but low prices on spot coal are made by some in the hope that these unsatisfactory conditions are only temporary and that business may improve later. Nevertheless the prices are made, and the result is that they are published, become a matter of common knowledge, and the consumer believes that those prices represent at least the cost of production, if not a profit. When prices advance to a reasonable figure, they then feel they are being robbed.

And, today, many Public Service Commissions in different states, watching and supervising the management and expense accounts in order to regulate the compensation that public utility companies shall receive for their service, jump on coal as one of the most important items to watch. It has been frequently the cast lately that many public service corporations have been

criticized because of contracting for coal of a certain quality that they require, and at reasonable prices, for continuing those contracts because some Public Service Commissioner hears that spot coal is being sold at maybe $1.00 a ton less than contract prices.

It becomes incumbent therefore upon the coal men of the country to go into a campaign of education on the coal problem with our Public Service Commissions. The coal men all realize the value of customers whose requirements fluctuate but little during the year, and are able to mine and sell their coal to that class of customers at a lower price, still making a reasonable profit, which cannot be done with the class of customers whose business is subject to extreme fluctuations and whose coal requirements are uncertain.

The offering of coal by producers who do not have their own selling agencies who depend upon jobbers and wholesalers for their market, and depending on the spot market for the disposal of their output, is causing a confusion today that is extremely unfortunate, and helps cast discredit upon the class of producers who are dependable in their contractual relationship with their customers and who never seek a spot market for their output, depending on annual contracts as a business policy, and who live up to their contracts no matter how high the spot market may be in times of coal scarcity caused by strikes or lack of transportation.

There has been much agitation during the past two years in attempts to pass through Congress bills regulating the coal trade. The public becomes concerned when a scarcity of coal is threatened, is thrown into a panicky condition and buys indiscriminately, causing high prices. Then, immediately there comes a public outcry against extortion, and we find plenty of legislators, willing to get into the public eye, proposing bills to regulate the industry; as a rule this outcry is against the operator, and yet the conditions that bring about these high prices have for the past forty years been caused entirely by lack of transportation, strikes on the railroad, or strikes at the mines.

If Congress would give the necessary attention to reestablishing our railroads on an efficient basis, after years of faulty regulation, one cause for occasional high prices for coal would be removed. Then, if they should give their attention to the prevention of national strikes, and a removal of the cause for them,

making the United Mine Workers legally responsible for their contracts, protecting the rights of those who did not want to belong to the union, there would be little need for further regulation.

There is one encouragement that we have today in the present Administration. In charge of the Department of Commerce is one of the ablest mining men of the country. He is a man of vision and force, and the coal and mining industry of this country can well afford to cooperate with him on broad lines. While we need less government in business, we certainly do need the cooperation of a department which is equipped to study, and has the ability to understand our problems, in order that false theories in regard to the handling or regulation of our industry may not make further headway in the legislative branches of our government.

In the past few days, Senator Kenyon has introduced two bills in the Senate affecting coal, both of which have been referred to the Senate Committee on Manufactures.

Senate Bill 2558 is a bill to define and punish profiteering in dealing in coal, and fixes margins beyond which profiteering is considered to be shown to exist. In arriving at costs, no interest on bonded indebtedness is allowed. It proposes to fix or supervise charges or salaries of the management. Depreciation and depletion are to be allowed, with Government agents to determine the amount. A maximum margin of 50 cents per ton in any one month is allowed for a small operator, and 30 cents per ton on all production over 5000 tons annually.

The coal industry has a seasonal demand, and many operators lose money for six months in the year, and under this provision would have no opportunity to secure an average margin for the year. It attempts to fix value on property by limiting royalties and, with the other objectionable features, it practically means confiscation.

The other bill, 2557, practically nationalizes our coal mines. It is inquisitorial and confiscatory, and would destroy all initiative and place the production of coal under regulation more drastic than anything heretofore experienced in government regulation not excepting the regulation of our railroads and public utilities.

It is my judgment that a gathering of proper statistics in regard to invested capital, cost of coal, realization, wages paid

and annual earnings might be of value in preventing the passage of such unreasonable, unfair and destructive laws as proposed by Senator Kenyon provided the statistics were gathered by a department of the government which would have no administrative authority, and no incentive to color the facts for political purposes, and whose duty would be confined to ascertaining the facts for the benefit of intelligent public opinion, making unnecessary the disastrous interference through government regulation of ignorant, inefficient or prejudiced public officials in the conduct of this great industry. The general public is very apt to think that coal can be produced at a uniform cost, not recognizing the physical differences that occur and which affect costs in every mine in the country, and has little knowledge of the varying qualities and relative value of these different qualities.

The American Mining Congress can well afford to give its serious attention to this proposed legislation. If by any chance such bills as the one proposed by Senator Calder about a year ago and the one recently proposed by Senator Kenyon should pass and become a law, it would inevitably lead to the passage of further regulatory bills affecting every phase of the mining industry and all manufactures, our iron mines, our great steel industry, textiles and shoe manufacturing—none could hope to escape as there is as good reason for regulating all industries as there is for regulating the coal industry.

The National Coal Association has a Foreign Trade Committee at this time investigating the conditions surrounding our export trade, which, with the exception of Canada has been brought down to insignificant figures of tonnage. The markets which we were supplying to a certain extent before and during the war are now able to secure their coal from England and Germany at prices that it is impossible for our producers in this country to meet. Surplus production, subsidies by the English Government, low steamship rates, and a definite policy to regain their foreign trade, partly account for our loss of this export trade. The high wages paid here to our miners, high freight rates, and inability to meet the foreign steamship rates, together with the unsatisfactory credit situation abroad, complete the story. We must have lower costs at the mines, lower railroad freight rates, stable and low ocean freight rates, to regain, or to participate to any extent in the foreign trade situation.

Next month there will meet in Washington probably the greatest and most important conference ever held in the history of the world. While it has to do with disarmament, it seems inconceivable that that conference can adjourn without taking some steps through which our government can cooperate in the rehabilitation of the credit of European nations. We, as coal men, are vitally interested in this rehabilitation; we must find a market for our raw coal; the coal that goes into our manufactories depends largely upon export trade, and we want to see the manufacturers, helped to increase their foreign trade; surely the great cotton-growing states are interested in stabilizing the European situation; our great agricultural section depends upon foreign markets for its surplus products. We have seen our copper mines output curtailed or shut down for two years because of the lack of foreign trade.

It seems to me that the American Mining Congress, through its influence should help cultivate a sentiment for substantial support and cooperation by this nation towards bringing back peace and prosperity to the war-stricken nations of Europe. Wonderful trade possibilities, when this is accomplished, exist in the development of backward countries, like Russia, Egypt, India, South Africa, South America, and especially in helping China with its great population and natural resources to take its place among the industrial nations of the world. There are enough markets in those countries which may be developed in time to occupy all the factories of the world. Instead of that, we see at the present time the industrial nations like Germany, France, England and the United States competing for each other's natural markets, practically accomplishing nothing towards the development of the wonderful resources of these other vast territories lacking transportation, modern facilities, or any of the luxuries which we enjoy today.

In connection with the activities of Congress, it appears to me that the American Mining Congress should adopt a definite program leading up to a recommendation for either the repealing of, or amendment to, the Sherman Anti-Trust Law, which would permit reasonable trade agreements that would tend to stabilize prices and production. The condition brought about by overproduction and unbridled competition is as detrimental and vicious in its effects as the extremes of high prices in a panicky coal market. It has been well said that it is impossible to create

a combination in the bituminous coal industry, but it is possible for the leaders of this industry, if permitted to get together, to formulate policies that would tend towards conservation of our coal resources, towards stability of production, towards wholesome treatment of labor, towards satisfactory treatment of the consumers, none of which can be done efficiently today owing to the prohibition under our laws of even discussing among ourselves agreements as to production or prices.

While the problems connected with the coal industry and the public that I have touched upon are serious and grave at present, I believe they will be more acute before we come to a proper solution, and it is for the reasons which I have referred to before that the demands of the United Mine Workers are unreasonable and unfair to the rest of our people. Their policy has become arrogant and autocratic, and by next Spring we shall be faced with a crisis in the way of a probable strike in the anthracite and bituminous mines of this country which may be extremely serious, and retard the gradual recovery that we are beginning to feel from the depression that has been so acute in the past few months.

A readjustment of costs, through greater efficiency, through narrower margins, through reduced wages, has been absolutely essential upon which to start the foundation of recovery. The United Mine Workers of America has failed to respond to this evident necessity, and with its demands for 40% increase in wages for anthracite coal, and its avowed purpose of imposing still further conditions on the bituminous coal operator, there is no promise in sight of its adopting a sensible policy.

With these conditions confronting them, there is nothing for the union operators of the country to do but to resist the further autocratic control by this organization; the operators not only owe this to themselves, but they owe it to the country at large. If they do not resist it with courage and sound common sense, the public can rightly hold them responsible.

The question may properly be asked: "What is the sound common sense way for the operator to treat with the labor employed around the mines?" Situated, as the operator is, with competition from other operators in the same district, and districts competing with each other, it is not an easy question to answer. A uniform rate of compensation for contract and day

labor is desirable because of competitive conditions. Owing to the varying conditions existing in each mine, between the mines in the same district, and the varying conditions between districts, the attempt to establish uniform and satisfactory scales has made but little progress towards general satisfaction, and the control of organized labor for the making of scale agreements of different districts centered in Indianapolis has proven a failure.

The only other solution that seems practicable to me is for the operators in different districts to resume their personal responsibility, dealing with their own men through mine committees knowing the working and living conditions, treating their men fairly, recognizing the nature of their employment and giving personal attention to the human element in their mining problems, ceasing to depend upon the professional labor leader for settling all of the relations with their own employees, as has been the case for the past twenty-five years in the union organization. The right of labor to organize should be conceded, but when the men who work for you delegate all authority to handle their problems to a central body located in Indianapolis, and unfamiliar with many of the problems they are called upon to decide, it is time to stop and try the more sensible method of getting back to personal contract with your employees.

In the final delivery of coal, the price of coal at the mines is but one factor. Freight rates have been increased 100 per cent. Cost of delivery in the cities has also increased at least the same percentage. All of these factors must be brought to a reasonable basis. I am convinced that with a policy of treating labor in the coal mines fairly and equitably as compared with the workers in other industries, and on the farms, recognizing the nature of their employment, and with a full knowledge on the part of the public of the issues involved, we can look forward through the trials through which we may have to go to a future where labor and capital will understand each others rights and responsibilities and where the sound public opinion of this country will secure freedom from the tyrannical control of this basic industry by any group of professional labor leaders.

I see in the future this country growing and expending with its wonderful natural resources and the ability of its citizens, and with the intelligence of the American public generally, there is no reason for any Bolshevist theories of destruction of property

rights; while those theories are still shouted by loud-mouthed agitators, they are commencing to fall on deaf ears.

The gradual growth of the country will demand within a short time a larger production of coal than any figures we have yet seen. Oil, which is today displacing coal in many industrial plants and on many of our steamship lines, will not be a factor, in my judgment, for any great length of time. The wonderful development of the oil fields of Mexico, one of the marvels of the age, has affected the consumption of coal by displacing it through its cheapness, but all the best information available today shows that those great fields are rapidly being exhausted and that within a couple of years, unless new fields are discovered, we are going to see coal resume its place as King in every line of industrial need. So that it becomes of importance that the mining men of the country, the labor representatives, the public, and our legislators seek wise counsel in order to prevent any group from attempting to throttle or handicap the bright future for this industry in which all should have a fair share.

Secretary Callbreath read Resolution No. 2 presented by Senator S. D. Nicholson of Colorado.

SECRETARY CALLBREATH: May I announce the membership of the Resolutions Committee as it is now prepared. Some of the states made no recommendation and I have selected the man who so far as I knew was a proper representative of the state. If the Resolutions Committee is not to your satisfaction, say so.

Alaska	John L. Steele
Alabama	Erskine Ramsay
Arizona	Arthur Notman
Arkansas	Walter H. Denison
California	E. C. Voorhies
Colorado	E. C. Stimson
Delaware	N. S. Greensfelder
Idaho	Francis A. Thompson
Illinois	Albert J. Nason
Indiana	P. H. Penna
Iowa	T. A. Dumont
Kansas	F. E. Doubleday
Kentucky	Henry Laviers
Louisiana	F. E. Mariner
Maryland	G. M. Gillette
Massachusetts	J. B. Hardon
Michigan	F. W. Sperr
Minnesota	F. A. Wildes
Missouri	Arthur Thacher
Montana	Wm. B. Daly
Nebraska	Roy M. Harrop
Nevada	John R. Allen

New Jersey.....Robert M. Catlin
New Mexico.....G. A. Caseman
New York.....Sidney J. Jennings
Ohio.....W. J. Montgomery
Oklahoma.....George C. Matson
Pennsylvania.....W. J. Thompson
South Dakota.....O. Ellerman
Tennessee.....F. H. Enright
Texas.....Wallace Pratt
Utah .....J. C. Dick
Washington.....Falcon Joslin
West Virginia.....R. M. Lambie
Wisconsin .....E. F. Yahr
Wyoming.....Peter Kooi

CHAIRMAN LORING: The subject of "Labor Unions and the Mine Operator" will be discussed by Mr. H. N. Taylor, Vice-President of the Central Coal and Coke Co., Kansas City, Mo.

MR. H. N. TAYLOR: Mr. Chairman, Ladies and Gentlemen: In 1898 the principle of collective bargaining was firmly established between the United Mine Workers and the coal operators in the Central Competitive Field of this country. The fundamental and underlying principle in this contract provided for the adjustment of disputes under the contract with all of the men remaining at work. This principle, eliminating the great economic waste caused by the old method of settling grievances through strikes, was considered a great step forward, both by the wage earner and the employer.

Another generation has come into the mines since the old time leaders established this splendid principle. This generation of wage workers found conditions as the contract had made them, and have not the same wholesome respect for the contract that influenced their fathers and predecessors, who had felt the old and burdensome conditions which have been alleviated by the contract.

Personally, I have the highest regard for union labor fairly conducted. I know from personal observation that it has accomplished much for the wage earner. In many instances it has brought him comfort and contentment that otherwise would not have been secured; but the miners' organization must be purged of the radical and revolutionary leadership that has sprung up in many districts before it can hope to regain its standing in public esteem.

The leaders, especially those of national authority, among the United Mine Workers, must refrain from giving their support to lawless characters who happen temporarily to be in office in several of the districts. They should devote their energy to eliminating

these radical obstructionists and to the re-establishment of the integrity of the joint contract between the operators and their organization.

Had the United Mine Workers been content to confine their effort to securing proper working conditions and the payment of reasonable wages, the encouragement of efficiency and individual effort on the part of its membership, they could have maintained the good will of the public which they had a few years ago. With this good will behind them they could have continued to keep their union in the front rank. Many of their leaders, in their greed for power, have become more and more unreasonable, until they are making it impossible for many union mines to operate. Perhaps only when they have driven the mining industry to an open shop basis will they learn that through their greed they have lost all that the conservative leaders of former years had gained for them.

The abuse of the check-off system that is in vogue and a part of the organized labor contract is even more serious to public welfare than the radical, lawless leader, because it is by this means that he is able to accomplish his end. In my opinion, it is the check-off system which is responsible for the growth of radicalism in the miners' organizations. In the early days of the contract, the check-off was a comparatively harmless thing. It was used only to check off nominal dues and sick benefits. Today its purpose is abused until it is a menace to public welfare. It is used to check off a large percentage of the miners' wage, and the vast sums obtained are used for purposes far remote from the purpose intended in the original contract. The huge sums realized from the check-off have been expended to carry on a lawless war condition in more than one of the non-union coal producing states. These funds have been diverted in another state and have been used for the defense of the I. W. W.'s under arrest for offenses against the laws of the nation. It was the vast sum created by the check-off which made conceivable the nation-wide strike of November, 1919, when the people were threatened with freezing in an effort on the part of the miners to enforce their demands.

The check-off enslaves the rank and file of the miners' organization. The individual miner's earnings are taken from his pay envelope in the proportion levied upon him, and the funds are often used for radical propaganda in which he may not personally be interested, and to which he is frequently opposed.

Although the contract distinctly provides that all the men shall remain at work while disputes are being adjusted, this clause in the contract is almost universally disregarded. The pendulum has swung back until now the strike is the weapon used almost as freely as it was prior to 1898 to enforce the settlement of disputes.

A radical leader will build a case and apply "economic force" —a polite word for "strike"—to enforce his demands, hoping to enhance his political standing in the organization.

These radical methods cause friction between the company and organized labor, and entail a great economic loss to all concerned, in wages to the miner and increased cost to the public.

During the war period coal was the only basic industry completely controlled by government. Five times the contract was adjusted to meet the demands of the miners. The pyramided cost of these advances in wages is estimated to be $1,695,831,-160.40 on bituminous coal produced during the period of government control.

The peak wage was reached December 31, 1920, and the contract in force under the award of the President's Commission will add $1,099,450,000.00 to the cost of coal for the year 1921, and will continue as a yearly charge so long as the present contract remains in force unadjusted.

These advances paid over and above the contract, which was negotiated by the operators and miners themselves before the industry came under government control, amounts yearly to as much as the entire cost of running the government in many pre-war years.

The boost in the freight rate on coal by the Railroad Administration under government control has added an additional burden to the ultimate consumer of $550,000,000 yearly. No wonder the public are asking for relief. The operators want relief as badly as the consuming public.

The smokestacks reared by the millions of industrial plants of this country are monuments to cheap fuel, which is directly responsible for our wonderful industrial growth. If we are to hold our commercial supremacy the coal industry must continue to supply the cheapest fuel which is within range of possibility. Unless the coal industry meets this requirement, it will continue to receive public criticism, and to an extent deserve it. Realizing

the necessity of readjustment, operators in all parts of the country have reduced their profit to the vanishing point.

Although labor is approximately 85% of the cost of production, the miners have steadfastly refused to readjust the present contract, and have served notice that they do not intend to accept a reduction even at the expiration of the same, April 1, 1922, but will ask for a still further advance.

Business must return to normalcy, but this cannot be done so long as a basic industry like coal remains on a war-time basis. The labor leaders must know their failure to readjust and meet present conditions has done more to prolong the depression and cause endless distress among working people than any other element. Still they have lacked the courage to advocate an adjustment, fearing the effect upon their political status in their organization. The rank and file of the miners have been kept in ignorance of the true situation.

The high cost of coal is translated into high cost of many other important commodities. Cement is an example; labor and fuel are its principal cost items. High priced cement retards building, and the housing problem is the result. The retarding of the building program has had largely to do with unemployment and high rents.

The high cost of fuel and transportation keeps high the producing cost of almost every manufactured article, which, in turn, affects the cost of living. Coal being basic, the cost of all commodities is affected, and there can be no real adjustment on a sound basis until the cost of coal is returned to a peace basis.

The wage worker is a consumer of all commodities, including the commodity he produces himself. What is commonly called the public is largely the wage worker himself. If we are to adjust and allow business to become normal again, we must treat the situation from a broad, nation-wide viewpoint, and not by class or the individual industry. A high wage paper scale with no work will not help the miner. A fair wage with regular work will build his yearly earnings to a basis of American living and allow the operator to offer cheap fuel to the consumer and reduce the producing cost of all commodities.

Gentlemen, it is up to union labor to do its share of the readjusting, not only in the public interest, but to help themselves.

If the miners continue their refusal to make a readjustment of an abnormal wage scale and on April 1st call a nation-wide strike, the operators must assume a public duty of standing for the public rights, and the well-thinking men of this country must stand behind them in this battle for the good of American industry and American freedom against a labor autocracy.

Now that is really the problem of the operator and the miner. Being from the Southwest—from Kansas City—I know you will all be more or less interested in knowing something first-hand of the trouble we have with the arch agitator, obstructionist, breaker down and enslaver of men—Alexander Howitt. Alexander Howitt is a little Scotchman—sturdy, aggressive, bulldog in his nature, with little real sense but a great accumulation of cunning. He is the best organizer I have ever known in my life. He came to this country from Scotland when he was three years old, and his father brought him to Braidwood, Illinois, the home of John Mitchell, Bill Ryan, and almost all of our labor leaders; I could name twenty-five or thirty of them. Braidwood is the home of the labor leaders in the miners' movement.

Alexander Howitt came to Kansas, and with his loud voice and aggressive manners brought himself into prominence and finally became the president of the organization. The Kansas coal field is peculiarly adapted for steam purposes, and the great cities of Kansas City, Wichita, St. Joseph, Omaha, and all those Missouri River cities are dependent largely upon the Kansas field for their coal. The district itself is small—probably eight or ten miles wide and twenty-four or twenty-five miles in length. It is a little basin of coal lying out there in the western prairies.

The town of Pittsburg, Kansas, is in the enter of that District and is the home of Alexander Howitt and the seat of his throne. He handles the cases in that District not as the president of Illinois or Pennsylvania or any of the large coal producing states, but as a czar sitting on his throne, with every case brought into his office and handled personally. It has given him a large individual power which he realizes fully and guards jealously.

The state of Kansas, you will find if you ever take the trouble to look over the charts, has not progressed in production in twenty years. That is largely due to the fact that the labor disturbances are so frequent that people will not place their orders in Kansas if they can place them anywhere else because they are so uncertain

of the supply on account of the numerous strikes that are always on in Kansas. Although the surrounding states of Illinois, West of us Colorado, East of us Kentucky, have largely increased their production and have reaped the benefit of the natural growth of the country, Kansas has gone along with almost a uniform production for twenty years, because, as I say, the people will only buy coal there when they have to buy coal there, and their output is controlled by their geographical location.

The word "Kansas" almost means strike in the coal industry, and when the great strike came on in 1919, of course we were practically the first on the tapis and all the mines were closed down. The Governor of Kansas undertook to regulate the situation, and the effort was about the same as almost all governmental controlled efforts. It was a failure. He had the greatest chance in the world because in Kansas, as you all know, we have a large portion of our coal produced from strip mines where the over-burden is small, the dirt is taken off and the coal is loaded from the pits the same as from a quarry. There were a number of these mines that had already had the over-burden removed and the coal was lying there ready to load and it didn't take skilled labor at all to move it; anybody that could shovel could load the coal.

The Governor came into the state of Kansas and performed one of the most remarkable feats; he insisted upon putting all the mines in the hands of the receiver; he put every mine in the state of Kansas into their jurisdiction and told the coal operators to get out. For the first time, the state government then realized what it was to deal with Alexander Howitt, although they had the coal which had already been stripped by the coal operators lying as open as this floor is and simply waiting to be shoveled into the cars. They got the support of one coal miner, and that man worked with those "aliens" you might call them, that had been brought into the coal field through the strike. This man was immediately disciplined by Mr. Howitt after the strike was over, was suspended for ninety-nine years and every one was told if they sold him anything to eat or gave him a place to sleep they would be treated by the miners as enemies to the union organization. The company tried to keep the man on and he did stay around, being driven from pillar to post for some months, and was finally driven out of the state.

The industrial law that was put in there was intended as a court of last appeal, and the politicians, not knowing miners as

well as some of us do, thought the miners would rush in there with their troubles, but the leaders, seeing that anything of that kind would immediately curtail their power, jumped into a fight with the Industrial Court, and from that time on we have had one continual turmoil in the State of Kansas. Instead of the Industrial Court bringing peace it has brought only war, and as an operator I couldn't tell you whether the Industrial Court was of any use whatever to us; they have been so busy fighting Howitt that they haven't done anything through the Industrial Court that the operators have been interested in, except noticing Alex going to jail once in a while. There has been a great deal of confusion as to the Industrial Court and Mr. Howitt being locked up. The general public believes Mr. Howitt is locked up by the Industrial Court. The miners have been given to understand, and I think the general understanding among labor people over the United States is that the Industrial Court has been the means of locking Mr. Howitt up in jail for disabusing its authority. That is not the case. The Industrial Court has no power to make a man bring his case; it is simply a tribunal. When they were making an investigation of the coal business, they asked Mr. Howitt, as they asked everybody else, to appear before them as a witness, and he refused to do so. Then they went to the Circuit Court and asked the Circuit Court to subpoena him to appear before the Industrial Court. The Circuit Court issued that subpoena and he put himself in contempt of the Circuit Court. The judge of the Circuit Court ordered him into his court to show reasons why he would not appear as a witness. He refused to appear and, therefore, was sentenced to jail for contempt of court, not the Industrial Court but the Circuit Court of Kansas. Then the Circuit Court issued an injunction against him closing the mines down. He again came in contempt of court and he was again convicted, and he gave bond. That was continued for five different times, so that he is in jail now for contempt of court—the same as any man who refuses to appear in Court.

Mr. Howitt is a man who demands absolute obedience on the part of his followers but gives no obedience and resents any discipline of any kind whatever. At the present time he is in jail in Kansas, having been put there because he refused to give bond. Of the four other times he was convicted he went to

jail once, got tired of it and gave bond and got out. As long as he can stay in Girard, Kansas, he is willing to stay in jail and make speeches from the jail platform and be made a hero of. They deposed the sheriff who allowed that liberty and sent Mr. Howitt up to a little town where the people of the town protested about even having him in jail there and got a committee up who protested, and he didn't like it because he didn't have any visitors and couldn't make any speeches. He gave bond and got out.

This time he is really in jail as any other prisoner because the sheriff there is a brother of Tom Harvey, and Howitt doesn't like their organization. When he came under the sheriff's jurisdiction he locked him up. They push his meals in under the door the same as anybody else. I believe now that the effort that is being made will bring this terrifically unjust and unfair condition not only to the operators of Kansas, the public of Kansas, but to the men of Kansas. Those men are the worst persecuted miners in America because they are always out on a strike to further Howitt's personal ambition. He is very ambitious, he wants to get to be the president of the United Mine Workers, and he has opposed everybody who has kept him from becoming president. He doesn't like John Lewis, and the fight that you are all familiar with in the National Convention was simply a part of the program. He had gone back to Kansas and was locked up on the thirtieth day of September, and since that time it is almost unbelievable but there has not been a wheel turned in the State of Kansas. This is the fifth time the entire state has suspended operations on account of that one man and his personal ambitions and bull-dog tenacity. He is a menace to the public, he is a menace to the industrial interests of the Southwest, and the people of the Southwest are tired of this Howitt situation. You hear it on the streets, it is generally talked, and it is said that if they could just keep him in jail and get the miners back to work they would have peace in the Southwest. I have my doubts; I think he will get tired of jail soon. He is in for six months; he has been in about a month, and I understand he doesn't like it at all, and some day I suppose he will give a bond.

In the meanwhile, the national organization has taken charge of the Kansas fields. This is a belated effort on their part, be-

cause the same things have happened time and time again. Again they are blaming the Industrial Court of muddying the waters. The reason that the National organization has come into Kansas has nothing whatever to do with the Industrial Court. The national organization are on record as opposing the Industrial Court the same as the Kansas miners are, but Howitt called a strike at two mines in Kansas last March largely to protect two or three of his henchmen that worked at those mines and had a contract to build a road and wanted the mines idle so they could get off to help build the roads and then come back to their jobs when they got ready. Howitt wanted them there because they controlled those two locals. It was all politics in the organization.

The national organization sent a representative committee to investigate the strike. They decided it was a rank violation of the contract and told Howitt to put those miners back to work. He refused to do so, and just about that time the American Federation of Labor meeting was on in Denver and the National President of the Miners, a candidate for the presidency of the National Federation, didn't dare to take any active step that might in some way jeopardize his standing at that time, so the operators owning those mines had their troubles dragged on and dragged on month after month, lying idle although the National told them to go to work. When they finally got by all their political scraps, Mr. Lewis then brought this matter into the National Convention of Miners at Indianapolis, and the Convention stood by Lewis and by the National Executive Board that Howitt had violated the contract and must return those mines to work, although they had been idle since March, and because he refused to obey not only the president but the Executive Board of the Miners and finally the entire National Convention of Miners and defied everybody in the locals up to the National Convention, they then took charge of Kansas, not as an Industrial Court matter at all, but simply because it was a rank, open defiance of the authority of the National United Mine Workers. That is the reason they stepped in—simply a fight in their own organization because this man Howitt had resisted his own organization just as he resists everything that retards him from doing what he wants to do.

I want to make this explanation because I think it is gener-

ally misunderstood over the country. You will readily see that the State of Kansas, through its governor putting a receivership in and taking all of our properties away from us, running them to suit themselves and then giving them back to us, and then the Mine Workers organization taking them away and running them, and Howitt in jail, makes a Kansas coal operator feel that he hasn't got much to say about his property. Between the government and the miners we are on-lookers.

I told friend Alex one day that if he had the sense God gave a goose he would sit on the fence and let us fight with them, because we would probably have had to. I suppose, knowing him as well as I do, that he will keep on fighting forever, and, therefore, we will never be involved in the Industrial Court, and some day they will probably have to repeal it.

There is only one other thing that I want to say this morning. We have had direct notice from the miners in the Southwest and from the national organization, through Mr. White, that they don't in any way intend to adjust this contract at this time. Mr White finally served notice on us, after we had a meeting for a week, that on the first of April they didn't intend to take a reduction and they intended to ask for an advance. What he said has been verified by the National Convention in Indianapolis.

Now if they do call a nation-wide strike on the first of April, it is going to be right straight up to the coal operators of this country to accept a public duty—we have got to get coal back to a fair basis which will allow us to function and allow the factories of this country to resume and industry to take its place. I don't mean by that we have got to cut wages below American living, but we have got to get a wage scale that will permit the mines to operate a fair number of days a week. The men will not be hurt but helped by such a process. If they blindly follow their leaders and come out on a strike—a nation-wide strike—we have got to take that fight up and we have got to fight it out. (Applause.)

CHAIRMAN LORING: I just want to tell you that I was under ground as a boy of twelve, and I have worked in every position in a mine, and I am now a mine operator, and it gives me great pleasure to welcome a gentleman who has followed in the same footsteps and gone further; that gentleman is Samuel

D. Nicholson, United States Senator from Colorado. (Applause.)

HON. S. D. NICHOLSON: Mr. President, ladies and gentlemen: It is needless for me to tell you what a pleasure it is for me to be with you today. I, too, was a young man once, and worked in the coal mines, but the major portion of my life was spent in connection with metalliferous mines, and I am fully convinced that the metalliferous mining has suffered more than any other industry save and except probably agriculture.

I want to tell you a short story about a gentleman who thought that he wanted to have his credit extended. He called upon his banker with whom he had acquaintance for some time, indicating to him that he would like to have a loan. The banker, not wishing to abruptly tell him that he couldn't extend him credit which he was asking for, said, "William, you come back tomorrow morning and we will talk about it." So promptly at ten o'clock, William was back, and the banker said, "Well, I have been thinking over this matter and I don't know that I can extend to you the credit for which you are asking. I don't believe I can do it; I don't think your financial circumstances will permit me to loan you this money." William said, "I knew you were going to say something like that to me this morning, and I sat up all of last night thinking this matter over, and I am not as bad off as you think I am. I figured out that there were more people that I didn't owe than I owed, so I'm solvent." Under similar circumstances, I take it that the metal miners of this country are solvent.

To satisfy the requirements of war, it became necessary for the Government to exercise the initiative in speeding up the production and mobilization of the essential war resources of the nation. These resources were constituted principally of the products and by-products of the agricultural and mining industries. The problem confronting the Government was not merely to insure the normal output of these products, but, in many cases, to make certain of a sufficient over-production to satisfy the additional requirements of Europe under the stress of war. The Governmental machinery in all branches was put to the severest test. The most unusual burdens were thrust suddenly upon the executive, legislative, and administrative branches of the Government. The available machinery of every governmental department was carefully analyzed to deter-

mine whether it could assume the responsibility and perform well the task. Wherever it was found that the governmental machinery already existing was not adequate, various agencies were created to supplement the organizations of such departments and to assume the responsibilities for supplying various resources. Power was delegated to these newly formed branches of the Government and responsibility centralized.

Upon our entrance in the war, the Department of Agriculture was well equipped to meet the problems of war. Its extensive machinery had been developed progressively since 1889, when that department was first represented by a Cabinet member. Through its many experiment stations and field agents, this Department was in close and friendly touch with the farmers all over the country, and it became necessary only to increase the field force in order to expand the service which was required to increase production. The Food Administration was organized solely to aid the agricultural industry in the conservation of food, an emergency requirement of the war, and not a prerequisite in times of peace.

When the mining industry was analyzed, however, the governmental machinery was found to be woefully deficient to cope with the many vexatious problems of mineral production. In making this statement, I do not minimize the excellent service which the United States Geological Survey and the Bureau of Mines rendered during this period of great national stress, but, what I desire to say is that there was no Secretary of Mines to correspond with the Secretary of Agriculture, who had personal contact and knowledge of that industry. There was no executive branch of the Government with well co-ordinated facilities to assume the responsibility which was imposed. It became necessary, therefore, to create many independent agencies for the purpose of extending and developing the governmental machinery to solve the war problems of mineral production. This, alone, should be a lesson to those in charge of our governmental affairs who must assume administrative responsibility, that the occasion never again should arise when the machinery is not well developed and available to meet any of the emergencies of war. A government, well equipped to deal with the resource production problems arising from war, is the best adapted to render the service needed in times of peace.

It is with this thought in mind that I have introduced Senate Bill 1957, To Establish a Department of Mines, with Cabinet Representation for the Mining Industry.

The first Secretary of Agriculture was appointed in 1889, in which year the agricultural output of the nation was valued at $2,460,000,000. In that year, the mineral output was valued at $551,000,000. In 1900, the mineral output had expanded to $1,064,000,000, or nearly double that of 1889. In 1910, the mineral output again doubled to a production of $1,992,000,000. The United States Geological Survey estimates that the mineral output of 1920 was $6,707,000,000, or twelve times as great as that of 1889, and nearly three times the value of the agricultural output at the time when the Department of Agriculture was created. Because of this rapid growth in the mining industry and the position of increasing importance that it has, and will continue to assume, for the nation as a whole, there should be no question but that it is entitled to Cabinet representation.

Another evidence of the importance of the mining industry to the industrial system of the nation is the amount of traffic which it supplies to the railroads. Of a total freight tonnage of 2,307,000,000 tons carried by the railroads of the United States in 1918, the mining industry supplied 1,500,000,000 tons, or over 65 per cent, while the combined tonnage of the agricultural and livestock industries was but 290,000,000 tons, or less than 13 per cent.

It is apparent from the foregoing statement that the railroads of the nation could not provide the necessary transportation facilities for the agricultural and livestock industries were it not for the fact that the mining industry sustains the major burden of their operating costs. This reflects the general dependence of the public upon the operation of the mines for the lowering of the cost of transportation on their food products. The cost of living would become prohibitive if the agricultural and livestock industries were forced to bear the entire burden of operating the railroad system.

The United States Geological Survey, in estimating the world's production of minerals, shows to what extent the United States has contributed. In 1913, the United States produced 39 per cent of the 1,342,300,000 metric tons of coal produced by the world. In 1918, we produced 355,900,000 barrels of crude petro-

leum, which represented 67.8 per cent of the total produced by the world. For the period 1857-1918 the production of crude petroleum by this country was 4,608,000,000 barrels, which represents 61.1 per cent of the total world output. This country, in 1913, produced 63,000,000 metric tons, or 36 per cent of the world's total of iron ore. We consumed in that year 64,500,000 tons of iron ore, from which 31,500,000 metric tons of pig iron was produced, or 40 per cent of the world's total, and 31,800,000 metric tons of steel, which was 42 per cent of the world's production. The United States produces from domestic ore about 60 per cent of the world's output of copper, and, through its commercial control of deposits in Mexico, Peru, Chile and Canada, supplies about 9 per cent more. The iron, coal, oil and copper reserves of the United States exceed the combined developed reserves of all other nations. This list of minerals extensively produced in this country would be greatly lengthened.

Practically all of the foreign nations regard the mining industry so important that they have made special governmental provision for it in creating departments of mines. In Canada and most of the British possessions, a Minister of Mines presides over the department. From an international standpoint, an industry which makes so prominent a contribution to the world's output of fundamentally necessary mineral products as the mining industry of the United States should be dignified by having a separate department in the government, presided over by a representative of the President's Cabinet.

The Department of the Interior, originally created to dispose of the public domain, has become the repository for numerous other odds and ends of administrative responsibility wholly unrelated to the purpose for which it was created and still more unrelated to the administrative problems of the mining industry. There are 14 separate Bureaus in the Interior Department of which but two relate to mining, while, in the Agricultural Department, there are 18 subdivisions, all of which relate to agriculture.

Under the present system, the United States Geological Survey and the Bureau of Mines are but two subordinate bureaus among 14 over which the Secretary of the Interior must exercise control. It is not conceivable, even though the Secretary might have excellent qualifications to solve the problems confronting

the mining industry, that he could, with his other manifold responsibilities as the chief executive of the Department of the Interior, devote sufficient time to the work. There should be a governmental leader for this great industry so fundamentally necessary to the progress of the nation. If a crisis should occur in the coal mining industry, or any other branch of the mining industry, who could be called upon on behalf of the administration to render advice, formulate a remedy, and assume the responsibility for the result without the creation of a special commission with its costly delays.

Many constructive laws have been enacted for the benefit of the agricultural industry and I am in hearty accord with all that has been done as favorably affecting the farmer and the general interests of the public. I contend, however, that the welfare of the mining industry is as fundamentally important to the general welfare and prosperity of the nation as the agricultural industry, and that consideration should now be given the request of that industry for a Department of Mines with Cabinet representation.

The Bill which I have introduced is broad and comprehensive. All activities affecting every branch of the mining industry, wherever located in the present governmental program, are assembled under one central control.

I am an exponent of economy in the expenditure of public funds. The creation of this new department will effect economies arising from the elimination of all duplications of effort of the various agencies now employed, and will expand the present governmental service to the industry at less expense. The mining industry is not benefited by duplicated activities, and would welcome this more direct and businesslike administration. The indirect benefits which would accrue to the public generally would be an even more important consideration arising from the centralized control made possible through cabinet representation and the creation of a Department of Mines.

In 1910, the mining industry produced $2,000,000,000 of new wealth and was then as much in need of a department to deal exclusively with its many problems as was the agricultural industry in 1889, with a similar value of production.

The mining industry has outgrown the governmental machinery provided, and yet the problems involved in our mineral

and metallurgical production are no less complex than those of an agricultural nature. Today, the nation is confronted with many economic uncertainties affecting all branches of industry. The ocean upon which we are sailing is uncharted and precedents are lacking to guide our course to safety and industrial poise. The solution of our industrial problems depends upon the reduction of costs of production. These operating efficiencies can be obtained only through improvements developed by research, and, in this connection, the Department of Mines would render a signal service to the mining industry. Without this effective assistance, our return to normal will be postponed for many years to come, and the unemployment difficulties aggravated.

I am informed by the Secretary of Labor, in a letter of recent date, that we have approximately 19,000,000 wage earners in the United States whose employment, either directly or indirectly, depends upon the production of minerals and their manufacture into the machinery of industry, the implements of agriculture, and the tools of trade.

This nation's labor will have to face the keenest competition of the labor of the world, and the superior operating advantages which our labor should derive from inventive improvements will mean the success and prosperity of the nation's business. Our problems of unemployment will disappear only when the wheels of our industry are all turning, and the speed of these can be greatly accelerated by the creation of a Department of Mines.

It should now be apparent to the people of our nation that, notwithstanding the abundance of our agricultural yield, we have over 5,000,000 men whose unemployment largely results from the present depressed condition of the mining industry.

I believe that there are those who still agree with the immortal Lincoln who delivered this message to the mining industry a few days before his death:

"Tell the miners for me that I shall promote their interests to the utmost of my ability; because their prosperity is the prosperity of the nation."

Now, gentlemen, I have had two hundred copies of the Bill which I introduced in the Senate relating to a Department of mines, prepared for you to take here, and it would please me much if somebody would distribute those among the delegates who have never had a chance to read the bill. I would like to

have you look over the bill and see whether or not it meets with your approval. (Applause.)

CHAIRMAN LORING: The subject of "Mine Management" will be discussed by W. H. Williams, Senior Vice-President of the Hudson Coal Company of Scranton, Pa. (Applause.)

MR. W. H. WILLIAMS: Mr. President, Ladies and Gentlemen: Physical infirmity has made it impossible for me to have my remarks reduced to writing so that you could read them as I proceed. I can only say, in justification of my failure, that I have the option of going to bed for six weeks or undergoing an operation, and I am laboring under considerable difficulty in appearing before you today. I have appreciated very much the attention which you have given the speakers who have preceded me. I have never seen its equal in any previous convention.

The problems which confront the management of any mining industry or any other industry are largely the same. If any problem can be correctly and clearly stated, all intelligent men can agree on the solution. The difficulty we find is in stating the problem.

I am going to approach the subject today from the standpoint of one operating many mines and having a large organization, and at the beginning I will just say a few words in regard to the anthracite industry. There are not many differences between it and other branches of mining. If there is any, it is in the number of veins in which we operate. We operate from eight to twelve veins. All of the mining operations have been going on in the anthracite fields of Pennsylvania since the early twenties. In the early mining the coal was recovered from the thicker veins, and the mining did not proceed along the lines of today. The pillars which were left in place were not regular, the mining maps were not preserved, and now that we are coming into the thinner veins we do not know altogether the condition of the coal in the veins in which mining has taken place. In the Northern field we have gotten into what we call the second mine, and the failures of the past are confronting us today. Had the mining gone forward in that way, had it gone forward as we proceed today, the pillars would have been columnized and our problems would have been much simplified.

There is one difference between the anthracite and the bituminous in that we have very little opportunity for the use of

coal cutting machines. I believe about sixty per cent of the bituminous coal of the country is produced with the coal cutter. Only in the Northern field does the coal lie sufficiently level to permit of their use, and until recent years the coal cutters were not sufficiently strong to stand up against the anthracite. In the Southern field the coal pitches so much that it is impossible to use the machine.

We have one other difference in the anthracite as compared with the bituminous, in that every miner or practically every miner employs a laborer, so that we have two men doing what one man would do in a bituminous mine.

In the anthracite field we pump approximately sixteen tons of water for every ton of coal that is produced. It is estimated that we pump water, lift the rock and pump in there the equivalent of about thirty-six tons for each ton of coal. This coal, after it comes to the surface, must be cleaned and sized, and for that we have what is termed a breaker. We have a model of that breaker on the ground floor in order that you may form some idea of the way in which the work is performed. These breakers are about one hundred and sixty feet in height, one hundred forty by one hundred sixty foot base. A modern breaker will cost anywhere from $1,500,000 to $2,000,000. It is estimated at that to open up a mine in the Scofield district, which will produce approximately one million tons a year of output. To furnish the houses for the employes necessary to produce that tonnage would cost approximately eight and a half million dollars. You will readily see that the investment necessary to produce the coal in the anthracite field is quite a considerable item.

Probably the first question which confronts the management is that of the personnel. I feel that too frequently we do not distinguish between knowledge and intelligence. There are many men who have the knowledge, but when it comes to the management we must have the intelligence as well as the knowledge. Of the two, the intelligence is the important factor. Give us a man with intelligence and he will acquire the knowledge.

On these men is dependent the selection of the men for the supervisory staff. In order to overcome the many mistakes which we have made in the past in the selection of men for these positions, we are undertaking now to select the men who in our judgment are likely to make good. We take eight miners

and assign them to special work—men who we feel will develop into sectional foremen. We take four sectional foremen who we feel are capable of promotion to senior assistant foremen. Then we take four senior assistant foremen who we believe to be capable of promotion to the position of foremen, and two foremen who we believe will be capable of promotion to the position of superintendent. These men are assigned to special work, first on one kind of work and then on another. They make reports of what they see, and based on these reports we determine whether or not we were wise in the selection of them for this kind of work. If they make good, they are likely to be the men selected for the first available vacancy.

We have often heard that the men in the management class devote too much time to detail. I feel we should make the distinction, however, as between the men devoting their time to detail and the men having a thorough knowledge of detail. It is absolutely essential that they know all branches of the work and of the day-to-day performance, in order that they may intelligently handle the problems which confront them.

Too frequently men are fearful that the men under them may develop so far as to jeopardize their positions. Our feeling is that the bigger you make the men under you the bigger you make yourself. The first obligation of any man is to develop these men under him, and I believe the real test of your efficiency as manager of any institution is the character of men you have selected for your supervisory staff.

At times the suggestion has been made that we should make some change in this staff because men are not making good, and in answer to this suggestion we have asked this question invariably: what have you told the man to do that he is failing to do? What have you told the man not to do that he continues to do? If you cannot answer either of those questions, then the failure of that man to make good rests with his superior officer rather than with himself. It is to be presumed that you have been put in the more responsible position because you have a greater knowledge of the industry in which you are employed. If you have that knowledge, you have also the increased responsibility of seeing that the men under you are given an equal opportunity to acquire full knowledge of the work to which they have been assigned.

Next in importance is the relation with the men. The first item which has a direct bearing on the relations is that of the miners' houses. I feel we have often made the mistake of painting all of the miners' houses one color, giving them the appearance of an institution. Some three or four years ago we tried out the policy of painting these houses in different colors and with a different body trim. That did not require any change in the construction of the house and no additional expense. The difference in the appearance has been remarkable and much appreciated by the men.

Next in its effect on the mine has been the character of change house or wash house where they change their clothes. We have the old-style locker such as you see in the country clubs, but when the wet clothes are put in there at night and when the men come back in the morning, the clothes are found to be damp. We have borrowed a plan which was developed in either Germany or Belgium. The building is some twenty feet in height with rafters from one end to the other and with strips of them near the floor. There is a chain going from the lower rafter to the upper, attached to which is a bucket and a clothes hanger. The man puts his clothes on the clothes hanger, his shoes and towel, soap and other things in the bucket, and pulls the chain until it goes up to the upper rafter, and locks the chain so that nobody can get at his belongings.

It is found that by keeping these rooms warm, in the morning the clothes are nice and dry, and we have gotten away from the musty smell which usually is found around a club locker.

Next in this report is the treatment of the men who are injured. We make it a practice that where a man is killed or seriously wounded, the superintendent must personally notify the family and extend such relief as is necessary at the time to tide them over their emergency. They are required to visit the men in the hospital and otherwise see that they are well taken care of.

We then have the question of discipline. We have adopted a standard. We got together the sixteen superintendents, gave them the causes for which men are disciplined, and asked them what in their judgment was a fair discipline for each of these offenses. From that, after they had reached their conclusions, we said, "That will be your standard. You must make the dis-

cipline more or less severe, but if you do you must state in writing your reasons for so doing." That has gotten away from the snap judgment which prevailed in the past and has very materially improved our relations with our men. We have established baseball grounds for recreation. Then we have established the mining institute. Originally we had in mind that this would be for the benefit of the officers only. The question was asked whether there would be any objection to inviting any of the men, and we answered that we would be very glad to have that done. Much to our surprise, over 800 men turned out at the first mining institute at one of the mines, as the result of which we changed the character of the meeting and the men are given an active participation in our monthly meetings.

We have also appointed miners' instructors. If the Poles predominate at a mine, we select a Pole. If the Italians predominate, we select an Italian, and so on. It has been found that by a slight change in the angle of the hole which is drilled and by proper instructions as to the charging of the hole, the amount of work which the men are required to do, the amount of powder they are required to use to blow down a given quantity of coal, has materially reduced, thereby increasing the earnings of the men anywhere from $1.25 per day after instruction. This is quite an important factor. It is the ability of the men to earn a reasonable wage that determines whether or not they are satisfied with their work; and with the improved performance which has come as the result of the instruction, we have gotten much greater degree of satisfaction among the rank and file. There is also the question of safety. Mining is a hazardous employment. Each accident is investigated by a safety engineer, and in addition to that we undertake to analyze the cause of accidents and see to what extent it is possible to prevent future accidents occurring. One of the helpful things is an accident chart locating on a map each accident which is reported. This soon brings to your attention certain places in the mines where accidents are of frequent occurrence, and a study of the accidents in that section enables you to apply the proper remedy. We have also taken the position that every man in our employ has a just grievance if he feels he has one until such time as the facts are clearly explained to him. The success of the institution is dependent upon the imagination of the officers, their ability to look into the future.

We prepare a five-year development program showing the coal from each section of the mine and from each section of each vein which we expect to mine during each of the coming five years. Based on that production estimate, we arrange our development program with reference to the driving of gangways, counters, air-ways, pumping, transportation, etc., and from these programs we make up our annual budget. The work of the different classes is assembled on the sheets, the estimated cost is shown, the effect on the output, the effect on our net earnings, whether it will increase our earnings or reduce our expenses, and the items of work selected for the coming year are dependent on the relative return which will come from the investment that is to be made.

In connection with these programs, we have made topographical maps of each bed. We are finding that is of considerable advantage in working out our transportation system so as to reduce the grades of our tracks, and thereby increase the work which can be performed by either the mules or the electric locomotives.

The statements are prepared showing the cubic yards of gangway work, air-way work, etc., which is to be done during the year, and at the end of each month a statement is made showing what has been accomplished and whether we are up to our schedule or not. Sufficient attention has not in the past in the anthracite fields been given to the question of transportation, and yet there is no one item which so materially affects the output of our mine. First we have the question of equitable car supply. We have numerous complaints from the men of inabilities to receive all the cars they desire. Analysis of the subject indicated that if there was a break-down, the tendency was to throw the cars into the chamber nearest the shaft with the result that the men in the outlying districts did not get a fair car supply. We now have an arrangement under which the men place orders for cars as they go to work in the morning, somewhat similar as the shippers on a railroad place their orders for cars, and a statement is made at the end of each day and at the end of each month showing the extent to which we have furnished all the cars that were requested by the men for each. We have found in some places where we were not furnishing a full supply, that the transportation facilities were inadequate to permit of supplying

all the cars needed for the number of men located in that section. Pending the time when we could make the development, we have reduced the number of men in that section, thereby enabling us to give a full car supply to those who remained at work, and without in the slightest degree reducing the quantity of coal that came from that section.

In handling the car distribution we have found it advantageous to install telephones in each section of the mine which are connected up with a car distributor located in the superintendent's office. With a view to testing the efficiency of the men in handling the car, we numbered all of the cars in a mine and kept a record of the trips which were made by each car. Much to our surprise we found that there were a number of the cars that only made a round trip in something like four days, notwithstanding the fact that we averaged about one trip per car per day for the entire mine. But this pointed out the places in the mine where delays were occurring in the handling of the cars and this study has enabled us to increase our output without increasing our number of cars.

Each superintendent is given a statistician. We feel, however, that in the past we have been what you might call dollar mad in preparing statistics. I don't mean that we were looking for the dollar, but in preparing our statistics we have used financial statistics rather than physical statistics in analyzing the operations. Financial statistics do nothing more than to indicate whether you are conducting your business at a profit or a loss. They do not measure the efficiency of your men. Your dollar is as changeable in its value as any other commodity, and with the changes in the rates of pay and the changes in the prices of material, any statistics which are based on dollars are not on a comparative basis. We, therefore, use the physical statistics. A man hour is the same today as it was yesterday, last week, or a year ago; it is the same over a five- or ten-year period. This is true as to the ton, as to the car, as to the locomotive, as to the mule, etc., and when your statistics are prepared on that basis, you have comparative figures over a five- or ten-year period which very clearly indicate the way in which you are drifting.

Among other statistics we have those relating to the refuse in mine cars and the topping of mine cars. A miner is required

to top his car anywhere from five to eight inches. The quantity of refuse is dependent on the character of the vein. For the purpose of testing these out, we have what is known as a jury house where three or four cars each day are supposed to be tested. At times we have found that the man in charge apparently was influenced by other than the best interests of the company, and so we have put on special testers, taking twenty consecutive cars from each section of each vein and testing them with these special testers. We have found in numerous cases that the average amount of refuse shown by these special testers was in excess of the average of the cars tested in the jury house, notwithstanding the fact that only the worst cars were supposed to go to the jury house, while with the special test we took the twenty consecutive cars, which very clearly showed that our sectional foremen were not reporting the worst offenders and arranging for their cars to go to the juryhouse.

The next physical test is that of the sizing of the coal, which is an important factor in anthracite mining. Some sixty to sixty-five per cent. of the coal is what is termed domestic sizes, that is used in the home. The balance consists of coal used exclusively for steaming purposes, the market price of which is dependent upon the price of bituminous coal, and which is very, very much below the average cost of mining, usually running from three to four dollars less than the average cost of mining a ton of coal. So you will see how important it is that we handle our practice in a way that will produce the most domestic coal.

One of our best tests is what we call the yield per hundred cubic feet. We have the cubinal content capacity of the car, plus the topping, multiply the number of cars handled by that cubical content, and dividing it into the output per day, which enables us to find out what the yield is per hundred cubic feet. That is affected by the topping and is affected by the amount of refuse, and if the yield is going off, it indicates that our supervisory staff are not giving sufficient attention to the refuse and topping.

We then analyze the coal prepared for market as to the percentage of refuse and as to sizes, to see that it meets the market demand and that the men are not undertaking to overcome their inefficiency by preparing an inferior coal for market. We analyze the refuse on the dump to see that good coal is not being

wasted. We also analyze the coal going to the boiler room with a view to seeing that the poor grades of coal only are put in the boiler room and the better coal allowed to go to market.

We also have statistics showing the tons of coal per keg of powder produced. Those are not only useful from the standpoint of indicating whether the men are being properly taught how to produce the coal, but when cases come up where the men claim that the coal is too hard in any one section, a comparison of the powder figures will give you some ideas to whether their contention is correct.

We also analyze the quantity of rock with a view to seeing its relation to the quantity of coal produced and its effect on our cost. Our man hour statistics are divided as between producers and non-producers, and we ascertain the quantity of coal that is produced per man hour or per man day. The earnings of the men are analyzed individually and by sections. This work is done by the auditing department. Where the earnings of the men in any section are indicated as below what we regard as a reasonable figure, they are run in red and forwarded to the colliery's superintendent who is required to make a personal examination of the situation in that section to ascertain why the men are not making fair earnings. This has helped us to locate some of the places where a car supply was insufficient and where it was impossible with our facilities to get sufficient cars back to the men.

The other question which confronts the management of the mines today is the relation with the public. There has been much misinformation concerning the coal industry. Prior to the war, the bituminous mines were not operated at a profit. Few, if any, received their costs, and it was impossible to keep the plant facility up to a proper basis. During the war, the situation was confused by the Navy commandeering the coal from one district and without making provision for taking care of the customers of those mines. Those people had to go in new markets and buy their coal, which brought about active competitive buying and created a buyer's market which was at the time misunderstood and caused people to be unduly excited.

After the war was over, it was found that there were considerable stocks of coal on hand, and for a time the output of the mines was reduced for lack of orders. When the freight rate

application was made indicating a thirty to forty per cent. increase in the rate, the buyers of coal naturally were anxious to stock up. This so accelerated the orders as to make it impossible for the mines to quickly supply all the coal that was desired. This again caused the people to misunderstand the situation and feel that there was a shortage of coal, with the result that we had an active buyer's market last year and a corresponding increase in price. Any time there is a buyer's market we have hoarding of coal. We had hoarding of coal last year, and this caused an over-production of something like one hundred to one hundred and twenty-five million tons of coal. Nearly any place you went throughout the country last year, you found stocks of coal on hand in the yards of the industries. It is the over-production of last year which is causing the suffering of this year from the standpoint of the operator. We are now getting rid of the surplus. As soon as that is over, we may reasonably hope for the coal trade to get back to a normal condition.

Prior to the war I believe the maximum production in the bituminous mines was about 445,000,000 tons in a year. Speaking offhand, I think the production last year was about 465,000,000 tons, the second largest in our history, and this notwithstanding the fact that many industries were closed down and others working only one shift where during the war they had worked two and three shifts.

You can readily see how much the over-production of last year has affected us this year.

Some suggestion has been made as to the effect of car supply on the operation of coal mines. We should bear in mind that notwithstanding the railroad strike of last Spring, the railroads handled the biggest tonnage in the history of the country—a bigger tonnage than any year during the war; that is of all commodities, including coal. In the case of coal they handled the second largest tonnage in our history.

The trouble is not so much from the standpoint of car supply as it is from the standpoint of the abuse of the car. On the average, cars are loaded to about two-thirds of their carrying capacity. The mileage of the cars is seriously embarrassed through commodities being held at destination awaiting orders of the shippers as to final disposition. If the railroads of the

country could secure a loading of only sixty-six per cent. of the capacity of the cars on the average for all commodities, which was done in 1918, and if they could secure an average mileage per car per day of only twenty-eight miles, which it is possible to do with the cooperation of the shippers, it would be possible for the railroads of the country to handle fifty per cent. more business than they have handled in any year.

In connection with the price of coal, serious consideration ought to be given to the many years in which the operators have operated at a loss and the conditions which confront the operators today, so that in making the estimate of whether the price to the public is fair or unfair, the figures should be ascertained for a five- or ten-year period and averaged to see whether they make a reasonable return to the miner on the investment he has and the work he does.

These are the only thoughts I have to suggest today. They are more the practical day-to-day questions, and if any of them should be useful in your work, I would feel that my remarks this morning would be really well repaid.

I thank you. (Applause.)

The meeting adjourned at one p. m.

SPECIAL SESSION OF COAL OPERATORS.

THURSDAY AFTERNOON, OCTOBER 20, 1921

The meeting was called to order at two-forty-five p. m. by Chairman Albert J. Nason, President of the Nason Coal Company.

CHAIRMAN NASON: Secretary Callbreath has a few resolutions to present.

Secretary Callbreath read Resolution No. 3 introduced by Horace Lunt of Colorado, on Bill HR7736; Resolution No. 4 from the Tax Committee recommending the appointment of a committee to study the state taxation of mines; Resolution No. 5, introduced by the Tax Conference, extending vote of thanks to tax commissioners who appeared before the conference; Resolution No. 6, introduced by Judge E. C. Stimson of Colorado, protesting against discriminatory taxation against mining properties and enterprises.

SECRETARY CALLBREATH: These resolutions are to go to the Resolutions Committee without debate.

CHAIRMAN NASON: I am glad to say to you that the exhibitors downstairs have especially consented to stop their machinery during this session, and I think we owe them our thanks for that because they came here to display their wares. I believe our thanks should be publicly expressed.

The program of this morning included an address which it was impossible to give this morning and which we are to have the benefit of listening to this afternoon. It is to be on the subject of "American Oil Resources" by Mr. H. G. James of the Western Petroleum Refiners Association. (Applause.)

MR. H. G. JAMES: Mr. Chairman, Ladies and Gentlemen: In the beginning God created heaven and earth, and down to the present man has been striving to solve the mysteries thereof. He has mastered the almost inscrutable secrets of the earth, the air and the sea. He can tell you how the rocks were formed, from whence cometh the lovely pearls, whither the source of the costly diamond, and his investigations have left little or no doubt as to the origin of coal. But one mystery remains sealed

in God's great "Treasury Vault"—ingenious man has thus far failed to determine with any degree of definiteness the origin of petroleum. One class of scholars adheres to organic origin and another to inorganic, and between them there lies a wide gulf of difference and speculation.

When God had fashioned the earth and the skies, He said: "Let there be light." And from that time down to our day God's own daylight was practically the only light the people had.

Then God said to Colonel Drake: "Go drill."

And Colonel Drake went into the then far west and drilled the first oil well.

That was one of the most important events in all history, for it brought a real artificial light to the use of the world.

Although petroleum had been known from the early ages, it was not until a little more than half a century ago it became a commercial product. In that brief time its development has been slightly short of miraculous, and in importance it ranks as one of the two or three greatest essentials to every-day life. In war it is indispensable; in times of peace it recognizes no substitutes.

It will not be my purpose to follow in detail the development of this spectacular industry, but simply to show briefly how this development came about, how the demand for petroleum has always preceded the supply, how that demand has ever been met, and how, in all probability, the full needs of the people will undoubtedly be satisfied indefinitely.

For thousands of years the world had groped in darkness after twilight. The need of artificial light became more and more insistent. During these same years an evolution in labor-saving machinery was taking place. Machinery was constantly demanding more lubricating oils. What little petroleum there was in the world up to that time was used largely for medicinal purposes. The whaling industry was unequal to the demand for lubricants. The world was beginning to be concerned over the problem confronting it.

It is significant, however, that there has never yet been a need that it was not supplied.

Whenever a cry goes up, some genius is at hand to still it.

When the world was in need of petroleum and its products, Colonel Drake drilled a hole in the ground, and started an industry which changed the course of human affairs.

In 1859, after the world had groped in the flickering light of resinous wood torches, lamps, made from rushes, stuck into vessels of lard or melted whale blubber, and tallow candles, an ingenious inventor secured a patent on a lamp to use oil, which had been for some years made from coal and shale and called kerosene. The same year saw forty other applications for coal oil lamps, and these applications averaged eighty a year for twenty years.

These early attempts to secure better light marked the birth-throes of the petroleum industry and answered the cry for more light.

As time goes on, Drake will be recognized as of no less a genius than Newton or Columbus, for his discovery heralded the dawn of a new era in the world's history.

Along with the response of petroleum to the cry for light came the supply of lubricating oil, in order that human labor might be lessened by machinery. Later came the requirement for more rapid means of locomotion, and oil answered that demand in the form of gasoline. Now comes the demand for a means to lessen home labor, and a genius devises burners for fuel oil. And no sooner is that necessity met, than comes the mechanical bird to navigate the air, and petroleum supplies a fuel impervious to the colds at great heights and man outsoars the eagle.

It is significant that coal did not come into general use until transportation made it possible. It is also noteworthy that when the world war taxed the coal mines it was petroleum that answered that outcry; when other means than railroads were needed to transport men and ammunition to the front, it was petroleum that saved the day.

It is now sixty-two years since Drake discovered petroleum. While we are yet speculating upon its origin, it has found its way into every avenue of life; it is manufactured into a thousand different articles, and it has been quite conclusively proved that a substitute for wheat could be more readily found, and at less inconvenience to the public, than could a substitute for petroleum.

In 1859, the production of crude oil in the United States was 2,000 barrels. Sixty-one years later, in the year 1920, the production amounted to 443,000,000 barrels. Who is there to say that we cannot make this production 886,000,000 barrels, if necessary? Last spring Arkansas did not have a single oil producing well. Today Arkansas is one of the big petroleum producing states, and no one can estimate its future output. We were told by scientists and officials at Washington that when oil became worth $1.00 at the wells the development of shale oil would become profitable, but we have seen Pennsylvania oil go to $6.10 and Mid-Continent to $3.50 a barrel, and still there was no demand for shale oil, and it was not profitable to produce, because it was so easy to go out and produce more natural petroleum, and make fortunes over night.

If twenty-five years ago you had told a man that in 1921 we would require more than 500,000,000 barrels of oil in the United States he would have said that long before the twenty-five years were up our petroleum resources would be exhausted.

But apparently we are now only getting started in the oil business.

Taking the percentage of increase in the number of wells drilled and the increase in the percentage of production each year since 1903 as an illustration of what we might expect in the future, it is indicated that the year 1940 should see 63,046 wells drilled and 2,129,329,600 barrels of oil produced. Do these figures seem impossible? Five hundred million barrels a year seemed as impossible twenty years ago.

In the period from 1859 to 1913, the United States produced 59.16 per cent of the world's crude oil, and in 1910, the proportion of the oil produced in the United States was 63.99 per cent. This proportion increased each year until 1918, when the United States produced 69.15 per cent of the world's oil.

On account of the big production in Mexico, the percentage of the world's oil produced in the United States began to decline in 1919 and was only 69 per cent that year and 65 per cent in 1920. In the meantime, Mexico increased its percentage of the world's supply from 63,828,327 barrels, or 12.4 per cent, in 1918, to 163,540,000 barrels, which was about 24 per cent of the world's production in 1920. Thus it will be seen that in the year 1920 the United States and Mexico's petroleum production combined

(and they practically belong to the same interests and should be counted a unit) was 89 per cent of the world's total crude yield.

When we consider the Mexican oil fields are largely American-owned, and that the combined production of the United States and Mexico increased from 81.4 per cent of the total in 1918, to 89 per cent in 1920, we see that American petroleum is still increasing its lead in the petroleum resources of the world.

And yet only a few months ago the Prophets of Gloom predicted a gasoline famine, with motor fuel at 70 cents a gallon.

Then an amazing and unexpected thing happened. In oil amazing things happen every now and then.

There was an over-production of oil and a frightful slump in prices.

The Prophets of Gloom were abashed. The producing oil men arise and abash them every once in a while.

But the Prophets of Gloom always come back. In this they are unlike the Optimist, who, falling from the hem of the hanging cliff, remarked as he passed the eagle's nest: "Well, nothing has happened yet."

Now that the price of petroleum is advancing again from no apparent economic cause, the Prophets of Gloom are once more predicting a year hence, or possibly two or three years from now, the greatest famine of oil the world has ever seen, if it has ever had one.

'Twas ever thus! In that immortal year of oil discovery, there stood in high places a gallery of doubters. One well never could supply the needs of oil. It sold for $20 a barrel.

But next year came a flood of it. The price went down to ten cents a barrel.

The sowers of sadness made incantation over the dead!

Then came the Civil War, and oil sold for $14 a barrel. The wailing places were crowded!

The price spurred drillers. Improved machinery came. Boilers succeeded horse-power as horse-power had succeeded the spring-pole.

A tidal-wave of oil came, and the price dropped to 50 cents a barrel.

In the years since then the pendulum of petroleum has swung back and forth. Its tick-tock has been Shortage—Plenty, Shortage—Plenty, Shortage—Plenty!

And every swing of the pendulum has brought its crop of dismalities, and probably will down through the changing years of time.

Away back in the eighties a Prophet of Gloom published in the High Wailing Place of a New York magazine a story which ran something like this:

"The production of petroleum can never become a great industry. All the oil comes from three counties in Western Pennsylvania. There is probably no oil elsewhere. It is certain the supply will be drained in a few years. The oil lamp, which has come into great popularity, is doomed to pass in a few brief years."

Not yet a word of gasoline! No motor cars! No internal combustion engines! No airplanes! No vision!

And so the years have come and gone. And lo! the Prophets of Gloom have multiplied even as the industry has developed into undreamed-of proportions.

Year after year they have prepared the winding sheet for petroleum. The birth and death of him has been recorded who would drink all the petroleum that would ever be produced in the Mid-Continent field, from whence now comes 60 per cent of the nation's output, while some of the first wells ever drilled continue to produce.

One hundred years from now no doubt those alleging occult powers, occupying the high seats of the Prophets of Gloom, will still be, as they have in the past, predicting in 20 years, the exhaustion of oil, while your grandchildren and mine will continue to reserve the right to disbelieve.

Thousands of wells are being drilled in search of oil in every state west of the Alleghenies.

The number of refineries since 1914 has increased 64.3 per cent. The capacity of established plants has been doubled and redoubled until the refining capacity today is TWO MILLION barrels, while the daily production of crude oil is 1,125,000 barrels.

In 1915 the United States Navy used 521,000 barrels of oil. Last year it used 16,600,000 barrels, and in five years it is expected to require 30,000,000 barrels.

Never before were oil burners being installed in private homes as rapidly as now. Oil is becoming regarded as safer, cheaper, cleaner and better than any other kind of fuel.

One concern is this year marketing over 1,000,000 portable kerosene stoves and heaters.

Over fifty railroads are now using oil as fuel.

A large percentage of the public buildings of the large cities are now heated with petroleum.

The British Government has gambled the safety of its Kingdom on the earth's supply of petroleum with the intention of making its navy 100 per cent oil fired. Other nations are doing likewise. Is it to be supposed these nations would trust their very existence to oil if they were not reasonably sure of an adequate supply for an indefinite period?

According to the 1920 census of agriculture for the United States, 1,979,564 farms had automobiles January 1, 1920, or 30.7 per cent of all farms in the United States. These farms had a total of 2,146,512 automobiles.

Motor trucks were reported on 131,551 farms, or two farms out of every 100. Number of trucks on these farms, 139,169.

January 1, 1920, there were a total of 246,139 tractors on 229,334 farms.

Eight states—Illinois, Iowa, Kansas, Minnesota, California, North Dakota, South Dakota and Nebraska—had more than half of all the tractors in the United States.

In 1920 there were 38 tractors for every 1,000 farms, but in the eight states named there were 106.8 tractors for each 1,000 farms.

Over $2,000,000,000 is invested in motor trucks. And all this investment, all these trucks and tractors, increasing so rapidly in number, are dependent upon the stability of the oil industry. Yet we do not hesitate to say we face the future profoundly confident.

We have to date produced in this country 5,428,800,000 barrels of oil. Geologists estimate there is still remaining in the ground 6,740,000,000 barrels of oil, or more than we have taken out. But this does not take into consideration the millions of barrels which undoubtedly will be taken from undiscovered fields even far-seeing geologists know nothing of now. It is safe to say the oil yet to be taken from the known fields will go much further

than the oil produced the last half century because of the exercise of greater economy in handling and more scientific methods of distillation and handling.

And finally when necessity requires, we may fall back on shale oil resources of the country which apparently are almost inexhaustible—Colorado, with a shale oil similar in composition to Pennsylvania crude estimated at 20,000,000,000 barrels, and Southwest Indiana with its shale oil reserve of 100,000,000,000 barrels.

This is almost incomprehensive. Does it look at all like an oil famine for centuries to come?

The northwest part of the United States has undetermined oil resources. Alaska has immense promise of oil. North and South Dakota are being prospected. A few days ago high grade oil was found in limited amount in Nebraska. It is believed this state holds large future possibilities.

When petroleum was first discovered, it was declared it would kill the whaling industry, because whale oil was the principal source of light, but whaling is still profitable. For many years oil exhaustion has been predicted, but oil production is still increasing in Pennsylvania and continues fabulously profitable. We shall be surprised if some of the richest oil fields are not yet found in Northeastern Pennsylvania.

Oil and riches have apparently always gone hand in hand. At the height of the whaling industry, New Bedford, Mass., was the thriving city of its day. It was rated as the richest city of its size in the United States. Today it is larger than it was sixty years ago.

Tulsa is the magic city of oil. Like the dawn of day it burst forth as with the rising of the sun, full of splendor and glory. It was as if Petroleum, personified as a mighty magician, had stood atop the Osage hills, beside the broad Arkansas River, and waved a mystic wand, and bade it come forth.

And who shall say that Tulsa is the last of the magic cities of Oildom. "Wildcatting" had been engaged in down in Oklahoma years before Tulsa. The geological formations in Alabama, Mississippi, Tennessee, Michigan, Montana, Washington and New Mexico are favorable to the development of as rich oil fields as heretofore discovered and already the restless pros-

pector is there "laying out the land." A number of wells have been found in nearly all these states.

The production of petroleum in the United States in 1859 was 2,000 barrels. Ten years later it was 4,215,000 barrels. In 1899 it had increased to 57,000,000 barrels. All this time fears were expressed that there would not be enough oil to supply the needs of the people. Yet by 1909 the output had increased to 183,170,000 barrels, and last year to 443,402,000 barrels. The present year will show still further increase. There is greater potential production today than at any previous time. More than this there is just as much evidence of a limit to consumption as there is evidence of a limit to production. Already there is serious question if automobile registration is not rapidly nearing its maximum. When geologists estimated 6,740,000,000 barrels still remaining in the ground they had not taken into consideration Arkansas, which in a few months has developed an annual yield of 20,000,000 barrels. Twenty-five years ago coal as fuel became scarce on the Pacific Coast and oil was adopted as fuel. Since that time the consumption of fuel oil in California has rapidly increased and the demand has been met. They are constantly finding new fields and better grade of oil in California.

In whatever direction you turn the use of petroleum has rapidly increased the past quarter of a century. The development has been spectacular. And yet in spite of this marvelous performance, oil today is overproduced and the industry, with more crude oil in storage, more refined stocks in reserve, more big fields ready for development, more refineries idle, is suffering the greatest depression in its history.

From an inspiration which Samuel Van Syckle, of Titusville, Pennsylvania, had, the pipe line system connected with the oil industry developed from a small private five-mile line laid between Pit Hole City and Miller's Farm to its present magnitude of 34,000 miles of trunk pipe lines now in use in the United States, extending from the Gulf of Mexico to Chicago and New York, and up and down the state of California.

In June, 1921, there were a total of 435 tank vessels engaged in the transportation of petroleum, with a gross tonnage of 2,238,484 tons and a tankage capacity of 1,019,322 gallons. There are now something like 130,000 tank cars engaged in the trans-

portation of petroleum products, illustrating again the tremendous resources of America.

In the 62 years of the petroleum industry 569,753 wells have been drilled in the United States and 5,428,813,786 barrels of oil has been produced, valued at $6,662,254,499. For more than 25 years men have been predicting the exhaustion of oil, and yet more oil was produced in the United States last year than in the entire first thirty years of the petroleum industry in this country. Whenever the demand has increased the "oil fraternity" has gone out and developed new fields. When the automobile came with its increased need of the lighter properties of the crude product of petroleum deeper drilling produced greater volume and a finer grade of the raw product. For a decade past the normal annual increase of output has been 20,000,000 barrels; so that at the close of the great war, with its unparalleled demands, there were more prolific oil fields in process of development, more oil "in sight," greater quantities of refined products than ever before. Instead of the war exhausting our supplies, it simply taught us how to go out and find. It taught us more scientific distillation. And now that the war is over, we find our reserve supply of crude oil aggregating more than 165,000,000 barrels; fuel oil, 1,269,419,283 gallons; lubricating oils, 258,638,-298 gallons. Never before were there such vast quantities of all these oils in reserve.

CHAIRMAN NASON: This morning we heard a very interesting address by Mr. Taylor on the subject of "Labor Unions and the Mine Operator." We learned something about the troubles in other states. The next speaker on the program is particularly qualified to talk on his subject. He used to be a coal miner. I don't know how much coal he ever dug, but I don't believe he shirked his job. He did hold many positions with the miners' organization up to and including that of the president of the United Mine Workers of America, so for many years connected with the mine organization he has now for many years been connected with the operators and has been secretary of the Indiana Bituminous Producers. We are favored in hearing this afternoon, on the subject of "The Legal Responsibility of Labor Unions," Mr. P. N. Penna. (Applause.)

MR. P. N. PENNA: Mr. Chairman and Gentlemen: I don't know what I ever did to the presiding officer of this meeting to

incur his displeasure and make it so difficult for me as his introduction would indicate. I have no paper to read to you, and what little time I use this afternoon I want to do it with a definite and distinct purpose in view, and I want to talk to you about some things that I think the American Mining Congress can help us to solve.

We have difficulties as coal men—lots of them; and we are always in the position, when we undertake to tell our troubles, of the partisan advocating his own end of the game and telling his own story, and we are always liable to the ordinary charge that we are biased and selfish in our presentations. That is natural; we are no exception in that particular to the general rule of mankind.

The American Mining Congress is a separate and distinct organization or institution. It is not a coal organization, but an organization that is constructive and big and represents nearer than anything else that I know of in America connected with industrial questions, the idea of the public, and can get nearer to the public than a partisan organization could be expected to do.

When I was invited to talk about this thing of Trade Union Responsibility, I simply said, "Yes". I wasn't at all certain that I was going to attend the meeting; I had been asked so frequently and had refused so often that I was ashamed to refuse again, and I said I would, and I thought that was about as easy a thing as my friends could select for me to talk about.

To adhere rigidly to the program, there is nothing to say in the world except that there "ain't no such animal" as trade union responsibility—legal, I mean, and I suppose that now it would be in order to quit. That is all there is to say about that subject.

There are, however, in connection with this question, several items that might be discussed that perhaps have grown out of the general demand, the general feeling that there should be legal responsibility and that this great country is too small to permit the existence and activity of anybody without involving legal responsibility.

We have conceded here today that the mine workers have a right to unionize. It doesn't matter whether we concede it or not, it is a fact; we don't strengthen it by any concession;

and it isn't any concession on our part; they have certainly a right to unionize, and any attempt to abridge that right is of a species of tyranny upon which we cannot afford to establish the relationship between labor and the employer in a big industry like the coal industry. Then we must find something else.

It has been said that co-operation, collective bargaining, should be resorted to. I want you to understand that there always have been and there always will be disputes between the employers and the employes, and it doesn't matter how strongly we might wish for a different situation, that will always be true.

In that connection let me say something else that perhaps you will not agree with: that this idea of mutuality of interest between capital and labor is largely exaggerated. There is not nearly so much of that as we would like to think. Now I am not denying that there is some, because there is; there is mutual interest between employers and employes involving the methods of conducting business, whether it shall be brutal or whether it shall be intelligent, whether we will have strikes or whether we will have reason. Strike is war; that is all it is. Until that question is settled (and that is our great problem today—how to settle it) it must always be before the industrialists of the land.

Recognizing that mutuality of interest, as far as we can now see it, it is not unreasonable to expect that those who follow us will see it further than we can, probably. There may come a time when it will be recognized and be made an actuality and influence the business to a greater extent than the most visionary, hopeful individual today can imagine. I like to think that will come, but I don't know whether or not it will; it is not here now, we know that.

Co-operation. Collective bargaining. Thirty-five years ago there were men in this nation who conceived the idea that strikes were brutal, that strikes meant war, that they made children cry for bread, that they destroyed property all over the nation, and just as soon as one strike was settled and before the parties to the conflict had recuperated from their losses and their hardships, before the miners paid their debts where they had gotten credit, and before the operator got his business around to anything like decent shape, then another strike ensued. They came about as often as spring and fall, and everybody was injured,

nobody profited from them. The coal operators grew poorer and the miners would have if such a thing had been possible. There was physical suffering.

There were some men that met in Indianapolis from the eighth to the twelfth day of September, 1885, and they were not employers of labor, either; they were not coal operators; they were a bunch of men inured to the hardships of the mine. They met there from various states in the Union, and they passed a resolution something like this:

"WHEREAS, Strikes are fundamentally wrong, wrong in principle, wrong in practice, and should, if possible, be avoided; therefore, be it

"RESOLVED, That we petition the coal operators of the states of West Virginia, Western Pennsylvania, Ohio, Indiana and Illinois, to meet us in a joint convention where we will sit down around the table and thrash out our difficulties and forever dispense with the brutal strike."

Understand there were not any Alexander Howitts in that convention. It was made up of men who had gone through a big strike in Ohio which hungered the miners and broke up some of the companies in the Hocking Valley in '84. Some of you remember it. There was a strike in Indiana for nine months. There was a strike in the Pittsburgh District for three or four months. Braidwood, Illinois, was the seat of war in Illinois at that time and had gone through a strike. The mine workers were anxious to avoid strikes, and together with the operators, it must be said to the credit of the operators, old Oscar Townsend of Ohio, our friends Dempster and Robbins and several from Pennsylvania, Jenny and Yeoman and others from Indiana, Col. Sweet and Mr. Lemon and some others of those old people from Illinois, started a joint convention. That joint convention was a declaration that the open shop had been tried and was a despicable, miserable failure. Lots of you don't like that, but you cannot gainsay it. It was a miserable failure under which coal operators nor coal miners could live. There has never been anything but the open shop. I have a little grandchild at home. She came home the other day and was telling a story of what the teacher told her. The teacher had been out in Colorado and was telling the children some things about irrigation of the land, building ditches and turning water loose, etc. The little child, with all the others, thought it was the first time such a thing had

ever been done, that it was a brand new thing because she had never heard it before. She was ready to dispute with me that such a thing had been in existence and that I had seen it a good many years ago. When I hear lots of my friends talking about the open-shop proposition and the closed-shop proposition, I think of my little grandchild. Why, the open shop is as old as the ages, and it is because it couldn't meet and didn't meet and doesn't meet, and you can't make it meet until you have absolutely revolutionized human nature, the demands of our present industrial system. It is true the Constitution of the United States and of the states and of the statutes, both Federal and State, in support thereof give to every man a right to work for whom he likes and for what he likes providing that the other man wants him to work for him; that is true. It gives to the other man the right to employ him or not. That Constitution and those statutes were made before corporations were organized, before the executives in corporations had their legal talent and experts in every department surrounding them; and perhaps it was before a subordinate's advancement in his industry depended upon his ability to cheapen production at the expense, among other things, of the laboring man's wages.

Gentlemen, let's be square. How can a poor individual butt up against a corporation and secure justice until selfishness is eliminated? How can he do it? Did you ever see it done in your lives? All of you old men and practical men and young men coming along have never in your lives seen an employe enjoy his rights—rights as sacredly and as forcefully guaranteed by the Constitution of our nation as any rights—his civil rights, his political rights, his religious rights, his industrial rights, and defend them under such conditions as exist. How can he enjoy and defend those rights as an individual against a corporation that doesn't want him to enjoy them? He can't do it. It never has been done, it never will be done unless selfishness is not eliminated but modified and made more intelligent. There is such a thing as an intelligent selfishness, I presume.

What should we do? Permit and encourage our men to unionize, provided always that they must respect the right of the other man as they demand respect for themselves. If they will not concede you that right, then there should be enactment of law that would compel them to do it or forbid their existence

as an organized body. That is the way I look at this thing. Every man should be conceded the right to make a contract. During the process of negotiating that contract every man should be permitted to ask for anything which he thinks he is entitled to. Of course, he doesn't always get what he asks for; you understand that, none of us do. After the contract is made, he should be compelled to respect that contract or be just as legally responsible as any other honorable business man is and wants to be.

I believe, gentlemen, that comes nearer to the solution of our proposition than anything else that I can think of. What is the use of talking about co-operation except it is between two parties of equal strength? Then you have real co-operation—or between a dozen parties of equal strength. There should be equality in the negotiation of contracts as between parties thereto. That means organization among the employers. You have got it. You haven't got it to such perfection as you ought to have. It means organization among the employes. When that contract is made they should both be equally responsible and be compelled to respect it.

Now we are told that cannot be done. I don't know whether it can or not. I know some big men in this nation have said that it can't be done, and other equally big men have said it can be done. At the present time we don't know just what the legal responsibility of the trade union is, or what it amounts to. There are some cases now pending in our courts that sooner or later will be determined and will make matters clearer to us than they have been at any time heretofore.

Judge Hughes said, "Incorporated unions are not persons and cannot be sued as such, and the members of those incorporated unions cannot be sued as members thereof." That was Judge Hughes' attitude in some of those trials in the past.

There is only one answer at the present time, seemingly, that answers the question as to what the law is as affecting us, and that is Aaron Burr's definition of law—that it is forcibly presented and plausibly maintained. But because of this chaos now, because of this uncertainty, rather, that exists at this time, it does seem to me that if all of the people who are interested in those questions, and especially the American Mining Congress, could agree among themselves and could agree in themselves as

to the policy and then pursue that policy, and ask our law-making bodies, our legislatures and congress, for a little while to suspend their rules of political expediency and get right down to honest-to-God work and make some laws covering this question, it would solve the problem. Then what would we have? We would have peaceable relations and operations. You men know we had it for a good many years, don't you—long, long years ago. The mine workers' organization then was not seriously complained of; it was not accused as a lawless body, and I want to say to you now that the accusation is true. The mine workers' organization today has got to the point where it has no respect for its own laws, no respect for law or order or decency, a defiant, autocratic, lawless mob. (Applause.)

The other day I was talking like I am now and a fellow said to me: "You are only getting some of the things that you started out after. Serves you right!" I don't know but what the point was in a measure well taken.

While I am talking about the right of the trade unions, I am not talking about the trade union that is not in accordance with law.

What would we have? We would have a legally responsible body of men on both sides; we would have no strikes; we would have conciliation and arbitration in preference as a method of settling disputes. The nations of the world adopt that method, that is, when they are of equal strength. This country and Great Britain would arbitrate; you know that; any dispute would be arbitrated. We must have equality, that is all. The mine worker must be able to defend his position, to defend his rights. They are as sacred to him as yours are to you, and he is entitled to enjoy them to the full, just as much as you or any other man.

The mine worker is not going to make a union and allow you to write his constitution and rules and by-laws. He is going to write them himself; he is going to make a union to protect his rights that are sacred and valuable, and he has a right to just as much as you have. If the mine workers attempt to do more than that, then there should be legislation in the shape of the big stick that will make them decent.

I want to tell you there are a whole lot of coal miners in America today that are decent and want to be decent and don't

belong to the lawless element. There are lots of good men among them who would like to have just such a union as I have dreamed of and as I am trying to speak of now. We would have a union strong, able to defend its rights; you would be strong, able to defend yourselves; and then like two strong nations—Great Britain and America—neither one of you would want to say fight, you both would want to sit down to the table and adjudicate your differences and settle them on a basis of equity; and further than that, if there should then come the time that you could not agree with your men, and they could not agree with you, some honest difference arising, then invite the public—the American public—and have the public do for that industry what they had demonstrated their inability to do for themselves. The public has a right to do that; they have no business interfering in our affairs until we have tried—not a bit in the world. We ought to be allowed to try. When we fail, then it has the right to take us over and say, "Gentlemen, you are incapable and we will do for you what you have failed to do for yourselves."

Now those are my thoughts. Those are my ideas, and I could talk to you for another four minutes, I expect, if I tried to on that same proposition, and I couldn't say any more than I have said except to answer things that I hear some of my friends saying. I don't want to get into that controversial situation, however. What I have said to you is for the sole purpose of trying to get in your minds the idea of thinking more about it and looking at it from the other angle.

This is only a fad, you know—this open-shop proposition. As far as the coal industry is concerned it is only a fad. What would you do with it if you had it? If you had a union of the mines, a little union at the mine, or if you didn't have any union and you got right down close to your employes and sat down talking with them, you would make a scale of wages, and over here would be the other gentleman doing the same thing; he makes a scale of wages, and all along the line in the same district and inter-districts you would all make a scale of wages and you would all make them different. The American consumer isn't going to give the man with the high cost production a little more money because he didn't have as much skill or a little too much humanity in dealing with his labor. No, he is going to

buy his coal where he can buy it the cheapest. Then what happens? Well, I would go out and have a meeting with my men, I would get in close touch with them and say: "John and Bill, my trade is gone; that fellow over there, Harry Taylor, went out and talked to his men the other night and they took a five-cent reduction from their wages. I've got to have a seven and a half cent reduction to get back that business or I can't get along. You know, Bill, your family needs your work and you know we are friends and we don't want to shut down our mine. That fellow Taylor has done that very thing. Now you take the reduction and I have got my two and a half cents to the good. I will go out and take his trade then." As foolish as that may sound to you, that was actually the rule of life in the coal fields of Indiana and Ohio and Pennsylvania and your great state of Illinois. What I say is true. Some of you old men back there know it is.

That is the way it would be again tomorrow but we can't live that way, and you know it. We must have uniform cost of production, as near as physical conditions will permit, and after we have done all that we can towards that uniformity, there is still enough irregularity in the physical conditions to make a great difference in cost of production, but we must do our part, we MUST do it. We have ceased to be a little community industry; we have ceased to be a little state industry; we are a national industry and the railways have eliminated to a very great extent any exclusive markets; we don't have them any more. We have got to go out and compete with each other and the world, as far as this country goes, and it is getting to be more so now; the world is our market.

I believe heart and soul in union labor, in union of employers, in collective bargaining, in responsibility before the law, absolute and equal with all parties affected, and the man that doesn't want it and won't submit to it voluntarily, by the eternal, should be made to do it or put in jail.

I thank you. (Applause.)

CHAIRMAN NASON: The program provides for discussion after this address. I am not sure whether you will wish to enter into the discussion at this time or not, but there is an opportunity should you like to do so.

MR. LOUIS APPERSON (Mt. Sterling, Ky.): It is evident that in the discussion we have had in regard to labor unions there is one point that has been entirely overlooked and that is found in what is called the Clayton anti-trust law. There is one provision in that that says, "Labor is not a commodity, hence it can not be held to any responsibility." You can't contract with labor to make it in such a condition that you can enforce the contract. What we need first is to get after the demagog that is seeking votes in order that he may make laws and keep himself in office, and it is just that kind of men that we have had in office that want to adopt such a law for the purpose of retaining them there. I think it is all right to have the labor unions and their organization; but on the other hand, the employer should have the same rights and responsibilities. It isn't every man who labors and is a member of a labor union that is as responsible as some other member of it. The employer should have the right to discharge any one in his employ for what he thinks is just cause without going before somebody to determine whether he has that right. We have a Labor Board in which they are seeking to control and direct how railroads and their employes shall be controlled. In a recent decision of that Labor Board, they said that a railroad has not the right to discharge a man because he is a member of a labor union; but in rendering their opinion they say that they do not consider the legal rights of either party but they sit merely as a board of arbitration and state what they think would be right between man and man. Hence, they said that they didn't do right to discharge that man, and they must take him back; but there is no provision in the law whereby they enforce decision on either side. What we want is some kind of a law that will apply to both sides, and when one side is dissatisfied he has the right to discharge or the right to employ as he sees fit.

What we want is some kind of a proceeding that will find the right and enforce it as to both sides. There is no legal responsibility upon the part of a labor union that you can enforce.

MR. W. A. CALVARY (Pittsburgh): I am merely getting up now to voice my own sentiment after hearing Mr. Penna's address. I feel in my heart that it meets with the approval of most of the men present. I think Mr. Penna has known me long enough to know that I have been in the coal business as long

as he has. He has pictured the coal miner's life. I know exactly as I know my own life that he has pictured the history of the coal miner's life in the last forty years. I feel that more time and more attention should be paid to perfecting a method to steer clear of what we all experienced in the old days before we had a miners' organization to deal with. In fact, along with Mr. Penna, I was a coal miner and took an active part as a union man, but unfortunately our unions of thirty or forty years ago are not here today. They have departed from the method they started with. They should get back to the old method and then we wouldn't have the trouble that has to be contended with now and that has been contended with for the last four or five years.

CHAIRMAN NASON: We are to have the opportunity to hear from a man who is not listed on the printed program, Mr. Wanamaker, who is the Electrical Engineer for the Rock Island Lines. He has a paper on the subject of "Welding—Electrical Art Welding." Mr. Wanamaker has an important paper which if he read it all would take more time than we have, and I asked him to condense it and give you a digest of it in ten minutes. (Applause.)

MR. WANAMAKER: Mr. Chairman and Gentlemen: I have listened with a great deal of interest to the talks just preceding having to do with the great fuel industry—the greatest in the world next to agriculture—oil and coal. During the first address I was carried back to the days when I used to hear more about church and Bible talk than I have recently, and I am inclined to feel that with a little effort on our part the Lord will provide. He has provided with this new art of electric welding, to a degree.

I am intensely sorry that necessity causes us to cut this little talk short, because it is a long subject; it is a new subject and but little understood. In that respect, although not entirely so, I am a little bit like the negro from Alabama who was drafted in the war and went to France. He became quite a linguist. He could talk more French than any of the others, which wasn't much, but to his comrades he was a linguist. One day one of his comrades came running up to him outside of his tent and said, "Alexander, you all talks dis heah French language, doesn't yuh?"

"Yes, I does; yes, I does."

"Den come wid me, nigger. I went over heah and bought some socks from dis heah store man and I give him all mah money and I didn't git back no change." They rushed over to the storekeeper. The great linguist says, "Parler vous Francois?"

"Oui, oui! monsieur."

"Then why in de hell don't you give dis nigger his change?" (Laughter.)

This is a long paper because it is new and it is a very efficient article. On the railroads we have started far in advance of any other industry, and it has meant a net return of three hundred per cent. on an investment totalling $150,000. The indirect savings have been far beyond that.

The mining industry had apparently not heard of this new process, and no doubt it was for this reason that they asked me to step over here today and try and tell you a little about it. No doubt in the papers that are published after this meeting we will be able to explain this process. Briefly, I might say this: that to date it is by far the cheapest method known to man for joining metals. Today it has been made possible, with the electric art welding, to fuse metals, not only iron and steel, but the alloys of iron and steel.

I feel, after a recent trip through the East and another one through the West (and I spent several years in the mining industry in tunnel work), that if ever there was a place that electric art welding has a field it is in the mining industry. Mines are located in inaccessible spots; they are isolated. You use machinery that is constantly wearing out.

Inefficiency of mines, if I may be pardoned for so saying, is almost as bad as some of the inefficiency on our railroads, but necessity has caused us to look out. We are increasing our efficiency. We must do it.

I enjoyed this talk on labor. What is the most important thing in the world after we have the natural resources if it is not labor? (You will notice I am not referring to this paper. They had that famous Gordian knot that everybody failed to untie, even with all the time they had to cut through it. I am going to do the same thing here. I am going to tell you off-hand in a few words what I can and the paper can go into the

printed record. I hope you may be able to study it at your leisure.)

After we have our labor problem settled, what is the next thing to do? (And we will never settle it until the millennium, but we can improve on the situation.) When that is temporarily off the slate and put in the pigeonhole, then it is time to turn our attention to one other thing, and that is efficiency. It is not necessary to work a man to death in order to work economically and efficiently, and that has been proved by more than one intelligent director of labor and materials, not only in this country but in other countries, but there is one thing that we have been deficient in, and that is in keeping up to date in making improvements as we should.

I was in China before I was twenty-one years old, four hundred miles up from the coast. What was the matter with China? She didn't keep up to date. She worked her people hard enough and she paid them little enough but she didn't get any place and she is the most backward nation in the world today.

What is the keynote? The keynote is thrift and frugality, not only in labor but in materials, and certainly today, while I am a comparatively young man, I have had the opportunity of world travel, and I know that that is a fact and I know that in this country before the war we were not as efficient as we should have been, and during the war, with all the months I spent up and down the Atlantic Coast and over this country trying to increase production on railroads and in shipbuilding, I had to deplore constantly and deeply in my heart the fact that we didn't apparently understand what efficiency was. "We built ships," to paraphrase Lloyd George, "and still more ships." We did wonderful work, but my God! at what a tremendous expense of inefficiency both in labor and material. We are going to be a long time recovering unless we start early. Competition is before us today we are going into the greatest competitive age that this world has ever known since we came into the use of the so-called modern science. Therefore it behooves, I firmly believe, each and every individual, and especially the engineer, if he be an engineer because engineering is based primarily on economics, to prepare for this thing. If the man is not a good engineer from the economic standpoint, then as far as the world is concerned—the public—he is not a success as an

engineer, he is a standardized engineer; he puts that together which somebody else thought out many years ago; he is not producing and he is not developing.

This is the American Mining Congress. No doubt the men who are here are very much engaged in engineering outside of the business end of the game. Engineering is of primary importance in the entire mining and milling industries, the same as the railroads. We are living in a mechanical age, the age of iron and steel, and we are rapidly approaching the electrical age. Electricity is in use today, and everything, if you please, from the sailing of our largest battleships back downward even into milady's boudoir, is being revolutionized by it. We must learn to use all of these new things efficiently; there is no place, no limit, where we can stop, and we know today that there is such a thing as electric art welding; it is a new art. There was a day when Robert Fulton built the steamboat Claremont on the Hudson River in the face of all the doubting Thomases that existed in the world. The greatest and most eminent mechanical engineer said it was folly for anybody to try to build a boat that would ever cross the Atlantic Ocean propelled by steam alone. Had it not been for somebody with an economic heart that was willing to go ahead and develop that, where would we be today?

The principles that we use in engineering and mechanics and design have always been in existence. It remained for somebody with an economic desire to develop those things. The principles that govern the construction and use of an automobile were in existence when Julius Caesar was on earth, and had somebody at that time had the ability or the desire to work along following up Leonardo da Vinci and the rest of those great and foremost engineers, Julius Caesar might have speeded down the streets of Rome two thousand years ago.

Why is it that we have all these improvements? Why do we live in comparative luxury compared to the people who fought the battles of the American Revolution? The richest of the people at that time didn't enjoy the comforts that the poorest enjoy today. The section man on the railroad is living better, if he chooses, than many of the richest men who lived in this country prior to the war of the American Revolution.

It behooves the engineers in whatever line they are, to constantly develop new ideas, to take new ideas that have been developed and apply them to the art in which they are interested. The electric art welding process today comprises the use of certain efficient machines, the use of certain welding machines or materials, intelligent engineering design after studying the various principles involved and in the actual operation, so that those standards and principles can be properly used and the proper processes and methods worked out in detail if success is to be obtained.

Today we have welding materials, commercially pure iron, mild steel, medium carbon, high carbon and high manganese that can be used in the electric art process, particularly applicable in many instances to mining and milling equipment, including the machinery that is used in mining and your power houses, in your tipples, in your mills, on your tracks, on your locomotives.

I could go on and talk indefinitely, citing application after application where it can be used—your steam shovel work, in mining ore, in the oil industry where they have already begun to use the electric art welding quite considerably to most excellent advantage.

In taking this brief time I would only like to say to you who are gathered here that when the time does permit I wish you would read this paper which we have developed for this American Mining Congress, I might say at the expense of a great deal of time and labor, in the hope that we can do our bit or our little part in increasing the efficiency in this great country of ours so we can go on and continue to reap the benefits such as we have received heretofore and the many more which are to come.

It is entirely up to us how many more benefits we get, how many more automobiles are possible, how many more houses with modern plumbing are bound to come. It all depends on the efficiency of labor and materials.

I feel that I am not asking too much to suggest to those who have it in their power to take this paper when it is published and study it, not only with a selfish interest for your own welfare but for the welfare of the business, industry or corporation in which you are interested or which you represent. But at

that it doesn't stop; it goes on down, if you please, like every other thing, whether it be too high or whether it be too low, down to that last ultimate consumer, and that is what we all are. In the final analysis we are all ultimate consumers of the other fellow's product.

I think that I have already exceeded my ten minutes and I am going to leave you with the parting thought, if you please, that you do give the attention to electric art welding which I think you will find, if you thoroughly investigate it, certainly does justify in the use of mine and milling machinery. (Applause.)

The meeting adjourned at 4:15 p. m.

FIFTH GENERAL SESSION

THURSDAY EVENING, OCTOBER 21, 1921.

The meeting, devoted to the subject of Standardization, was called to order at eight-thirty by Colonel Warren R. Roberts, Chairman.

CHAIRMAN ROBERTS: We must first apologize to our audience for delaying the opening of this meeting for half an hour, but we believe that the importance of the subjects to be discussed were worthy of a real audience. We brought men here from New York and Washington to address you on what we consider very important topics, and we hoped by delaying our meeting until about the time people usually go to the theatre, we would have a better audience. Before we begin our regular program, our Secretary has some resolutions to present.

SECRETARY CALLBREATH: I want to announce that at the meeting of members this afternoon, the following gentlemen were elected as directors to serve for three years:

Bulkeley Wells, Denver.

E. L. Doheny, Los Angeles.

Sidney Jennings, New York.

H. W. Seaman, Chicago.

I might say that our Board of Directors consists of twelve members. The effort is made always to have them distributed as nearly geographically as possible to cover the nation and at the same time so as to represent as nearly as may be the different branches of the mining industry.

I want to read, as the by-laws require, a few resolutions as presented.

Secretary Callbreath read Resolution No. 7, presented by Mr. A. G. McGregor; Resolution No. 8, recommending that the increase in freight rates on railroads be abolished; Resolution No. 9, introduced by the Tariff Conference; Resolution No. 10, on Americanization; Resolution No. 11, by the Tariff Conference.

CHAIRMAN ROBERTS: You will notice, by referring to your programs, that this is the Fifth General Session of our Convention, and through the courtesy and the generosity of

our convention management, the session is to be devoted to Standardization.

As an introduction to the subjects which the speakers will discuss this evening, I think a word of explanation as to our understanding of the meaning of standardization would not be out of place.

As I remember, the motto of the American Mining Congress is "Safety, Efficiency, Conservation." These are the ideals which the American Mining Congress has been striving to attain, since its organization. However, until the Standardization Division was organized, the American Mining Congress had no machinery set up exclusively to attain these ideals.

Standardization in its proper interpretation and application fulfills the ideals of the motto of the American Mining Congress.

You are all familiar with the meaning of the word "safety." We have had campaign after campaign to teach our people the great value of safety.

Efficiency is the watchword of our great industrial organizations. Therefore, you are all familiar with what efficiency means. It has doubtless been the greatest factor in creating our great industrial concerns.

Conservation is a very broad term often misunderstood and misused. It was first given national importance by the great American, Roosevelt, and since he made "conservation" popular with the American people it has had many followers.

Those are the three ideals of the American Mining Congress, and the Standardization Division is trying to realize those ideals for the mining industry.

You will note, as the speakers of the evening come before you one by one, that they are all young men. There is an old motto: "Young men for war and old men for counsel." This is not exactly war, but it is a great campaign, and a campaign is a part of war, and this program tonight is a part of our campaign. We have therefore, selected our young fighters, and I hope they will be as full of pep tonight as they have been in the past in helping to win other victories.

Some years ago there was a great article written entitled, "A Message *to* Garcia." I understand that that message has been translated into more languages and read by more people than any other document that was ever written. Tonight we are

going to have a message *from* Hoover. I hope that this message will be as important to American industry as the message to Garcia.

The messenger who has been selected by Mr. Hoover to bring his greeting to the American Mining Congress and the people of Chicago is Mr. H. C. Morris, Chief of the Fuel Division of the Bureau of Foreign and Domestic Commerce. We will now hear the message.

MR. H. C. MORRIS: Mr. Chairman, ladies and gentlemen of the American Mining Congress: I bring you a message this evening from one of our own kind, whose broadness of vision and sureness of accomplishment have made of him not only a mining man of international repute, but also a humanitarian whom the whole world holds in affectionate regard and is proud to honor, the Secretary of Commerce, Herbert Hoover.

Mr. Hoover asked me to say to you that the Department of Commerce is charged, under act of Congress and by virtue of the desire of the Federal Government to be generally helpful, with the stimulation of the distribution of commodities. The mineral production of the United States is, therefore, a matter of keen interest to the Department and one in which it has the greatest anxiety to be of service.

The Department is *not* a regulatory Department, but a Department of service. Its functions, so far as they are developed, are largely in the direction of the promotion of foreign trade, the furnishing of statistical information both foreign and domestic, and the conduct of investigation work in the great physics laboratory of the Bureau of Standards.

Except for a few of the metals our export trade in mineral commodities is indeed badly disorganized, and it is with the purpose of assisting the industry to better this organization that we have re-organized the Bureau of Foreign and Domestic Commerce and installed in it a Fuel Division. We hope to be able also to establish divisions to directly assist the business in other minerals.

It is the desire of the Department to cooperate with the great voluntary bodies of the industry in the development of this service, for the Department is endowed with agents in almost all quarters of the world and is able to develop facts with

regard to supply and demand, and to assist the American exporter in the actual negotiations of his business.

Success in selling, whether at home or abroad, is founded upon an accurate gauging of buying ability; and that, in turn, must of necessity be based upon accurate and prompt information of general conditions in the market centers of the world, and upon specific conditions of competing foreign industries.

In statistical information the reorganization of the Bureau of the Census, to cover a wider field of live and current statistics, is of profound interest to the mineral industry; not only because that industry depends considerably upon the trend of other industries, but also because statistical information of consumption in the industry itself falls far short of satisfying the necessities of the business.

In the reorganization of the Bureau of Standards to include the wide theme of manufacturing standardization and simplification, the Department again comes into relationship with the mineral industry.

For all these reasons it is the keen desire of the Department that it should be brought into closest relationship for cooperation with the industry, and it seeks the appointment of a committee from your Congress, which will cooperate with the Department.

The mineral industry of this country should gain a position in the world's trade commensurate with the abundant resources of the United States. We must develop a spirit of mutual helpfulness and coordination of effort in order to meet the competition of organized commerce abroad, and with that purpose in view, I pledge you the full assistance of the Department of Commerce.

CHAIRMAN ROBERTS: I am sure that you will all support me in extending to Mr. Hoover through his messenger, our very hearty appreciation of his message to us, and that we will undertake immediate and careful consideration of the suggestions contained in his message.

We have heard a very great deal of late, much has been written and bills have been introduced into Congress with the object of trying to stabilize the coal industry, as they put it. There are many doctors offering a cure for the supposed ills of the coal industry, but no suggestion has been made to date and no

bills have been introduced in Congress that seem to meet the requirements of this case of stabilizing the coal industry.

We are now going to have an address by Mr. C. E. Lesher, Managing Editor of "Coal Age," the greatest coal journal in America. He will speak on "Standardization as a Factor in Stabilization of the Coal Industry." (Applause.)

MR. C. E. LESHER: Mr. Chairman and Gentlemen: Intelligent conception and application of standardization spells progress. The narrow view means atrophy. Standardization must be viewed broadly, not as an effort to reduce all to a common denominator. The accepted creed of labor unionism that standardizes individual effort and initiative by setting maximum standards of performance is nothing short of vicious. No less vicious is any effort to set standards of profit in business, standards having no regard to service performed. Less than a year ago in an address before the American Economic Association at Atlantic City, Mr. George Cushing said that as the managing director of the American Wholesale Coal Association, probably better known to you as the coal jobbers, he had been studying the marketing of coal and in two years had got no further than to consider the advisability of having a fixed return to the jobber and that the figure then thought best was 50 cents per ton. That is not the kind of Standardization we want.

If instead of setting standards of maximum effort that prevent the rise of able men, strangle competition, and stifle initiative, the labor unions would standardize on minimum effort, they would be more in keeping with the spirit of our conception of social justice. A phrase as yet not satisfactorily defined is "The American Standard of Living." You may well conceive to where we would come were we to seriously consider that living conditions could actually be standardized, the same for every individual. Yet there are and should be, certain aspects of living conditions that are properly to be considered as subject to standardization. So it is with mining coal. We may properly fix upon the pitch of thread for a screw of given diameter, but we must not attempt to say that only screws of certain diameter must be used. Rails are quite properly manufactured in a series of weights per yard but standardization in the use of rails that goes beyond the definition of the maximum moving load that should be carried on rails of each weight, is mis-applied.

We may have the room and pillar system of mining as a standard form, but we must not attempt to define the width of all rooms, and the thickness of all pillars. Conditions at each mine and often in different parts of the same mine control these things. In other words, in the mechanical processes of mining it is the standardization of broad principles of methods and practices that we seek rather than narrow details. As I have watched the development of the program of the Standardization Conference here this week I have been impressed with the sound reasoning that is back of its direction. Petty details are brushed aside and thought has been directed toward the big things. Mining engineering in the coal industry in this country has advanced far in the direction of use of machinery for the purpose, as Director Smith so aptly put it yesterday, of product increasing rather than narrowly, of labor saving. The high broad conception of standardization held by Col. Roberts, the chairman and guiding spirit of this movement in this Congress and Conference is leading you in the direction of progress.

But standardization need not be confined to the mechanical and mining engineering aspects of coal. It has already taken a large part in your relations with labor. Wages are standardized. I think none, even the most partisan non-unionist but will agree that the standardization of wages effected by the contact between the operators and the labor union through some 25 or 30 years of collective bargaining has benefited the coal industry. It has stabilized the industry; it has even in the past stabilized strikes, and put them in the even years and at a certain time in the spring. For these benefits, if for no other, and despite its failures, I never expect to see the abolishment of collective bargaining in the coal industry, though its form and animating spirit and program of nationalization must be greatly amended and changed.

It is perhaps significant of the fact that labor is the largest problem of the coal industry, that standardization has proceeded farther here than in any other aspect of the business. Contemplation of its application may help us to more clearly see where such a program will lead us in attempts at standardization in other directions. In the first place we find base rates that govern over all the producing fields, union, of course, and ultimately non-union as well. But the standard wage is not the wage for

all. There follow differentials by fields, predicated on differences in underground and even on market conditions. Finally the standard wage is not applied to each mine and further than that, to each working place. Deficiencies command a bonus, unusually attractive working places attract the most efficient labor. Standardization of wage has been a great asset to the coal industry, it is only with the arbitrary attempts of the union to standardize individual effort and prevent progress that we have serious quarrels.

It is somewhat as if the manufacturers of machinery should organize a tight union and dictate to the coal operators the kind of equipment they should use and also just how, when, and where, it should be used. They might in some instances improve on prevalent practice, but in the long run the result would be retrogression and increased cost, because such a course would be contrary to the principle of individual freedom and enterprise.

The largest undeveloped area in the coal industry in which standardization is yet to play a substantial part is that of marketing, and it is here that lies the richest opportunity for stabilization of the industry. Fundamentally stabilization means leveling off the peaks in production and price and filling up the depressions. It means giving uniform employment to men and to capital engaged in the production and distribution of coal. In one branch of the industry, that of mining anthracite in Pennsylvania, that condition has been very closely approached. Steady price levels for the principal product of the hard coal mines and comparatively steady rates of production have been reached through standardization of product, that is by setting up definite sizes, and by standardization of prices. In neither quality, size or price is there positive uniformity but the variations are minor as compared with those obtaining in the bituminous coal trade. The approach to uniformity has been sufficient, coupled with a standard method of merchandising to produce for the anthracite industry a degree of stabilization that is the aim and ambition of the soft coal trade.

The inherent difference between the anthracite and bituminous coal industries make the approach for the latter more difficult than those confronting the hard coal operators in 1902, when they initiated the program that has been of such a benefit to them and the consuming public. Instead of a compact area

with relatively few producers as with anthracite, bituminous coal is widely scattered, of greatly differing qualities and grades and in the hands of thousands instead of hundreds of producers. Instead of catering to but one primary trade, the household user, the bituminous is the fuel of all industry and transportation as well as of the home.

The first step in standardization of marketing relates to quality and preparation. The next is the education of the buyer and consumer in these standards. An outstanding illustration of what can be done in this direction is found in the development and operation of the pools in the coal trade on the Atlantic seaboard.

In less than three years classification of eastern coal by pool number has become so well established as a feature of the trade that despite the fact that the exchange handling the business has been discontinued, the trade continuing to quote coal by pool number and the buyer continues to think in terms of coal by pool. Pool 1, for instance, has come to have a definite meaning as regards quality, a meaning accepted by seller and buyer alike. This simplified business in that coal. Producers of large tonnages with well established names are able to carry on without the organized assistance of such a system of standards and have therefore largely operated outside the voluntary tidewater coal exchanges, whereas to the smaller producer, the organization has been a great help in marketing.

The ultimate development in this direction is found in the form of exchange adopted by the shippers of coal on the Virginian Railway in the smokeless field of coal produced in their area, classified their product in terms of ash, sulphur, volatile matter and heat value and in their tidewater business are able and do guarantee the quality of each shipment. And because they collectively are able to give such guarantees there, operators have through this form of standardization, stabilized their market.

Not every field is so favored of Nature. However, as the smokeless of West Virginia, Central Pennsylvania, for instance, presents such a myriad of varieties of coal as to defy such definiteness of classification. The answer here, of course, is to split up Central Pennsylvania into logical units of small producing areas and standardize the product from each district. Where

the classification of coal in this area has so far failed is in not defining standards.

It has been proposed to classify all coal produced and to assign each mine to some class. It has even been proposed that the Federal government should inspect all coal shipped in interstate trade and give guarantee to the consumer, as it were, as to the quality of what he is buying. We may perhaps, some day come to this, for as the advocates of this proposal, point out other basic commodities, as wheat, are already so handled.

The fact that such a scheme finds advocates is evidence, not to be overlooked by the shipper of coal, of the need and desire on the part of the consumer of coal for some sort of standardization. Perhaps the most we can hope for in this respect over the greater part of the bituminous coal field is standardization of sizes. Standardization in quality is more difficult of approach because what is poor coal for one purpose may be the best coal for some other use. What is needed then is standardization of use, the determination of the kind of coal, taking into consideration both chemical analysis and physical properties, that is most suitable for each boiler plant and for each process. As may be expected the consumer is taking the lead in that direction, the National Association of Purchasing Agents only recently having taken up the question of standard specifications for the purchase of coal.

In the matter of contracts governing the purchase and sale of coal, there is great need for standardization. The crying need here is for a revolution that will make the coal contract a binding document. This result cannot be achieved simply through the process of drawing up a legal paper, it must come through a change in the method of selling coal. When the coal shipper is in position to bind himself to deliver under all and every circumstance the coal he sells, then he will be in position to require of the buyer a guarantee that he take under all conditions the coal that he has purchased. We cannot complain that this angle of coal marketing has not been standardized. On the contrary the practice of holding a coal contract merely as an option to sell or buy is altogether too common.

Taking the broad view of standardization and the practical view of stabilization, the question may be summed up by saying that the possibilities of the one for bettering conditions in the

coal industry are great enough to warrant their intensive study and application by all seeking the other.

CHAIRMAN ROBERTS: In preparing these programs for the Standardization Conference, much care was exercised in trying to produce a well-balanced and constructive program for each session. Therefore, in preparing one of our programs we decided that it was very essential that we should have an address on the subject of "Standardization as a Factor in National Defense." Some of us who are familiar with the methods used in the great central work at Washington, in trying to supply our armies in the field with all of the necessities of warfare, know that standardization at that time was a real factor in winning the war. We, therefore, believe that it is appropriate to include in our program an address on this subject. We requested the War Department to send representatives to attend our standardization conference, and that one of these representatives should give us an address on this subject. We requested that they send Col. George S. Gibbs of the general staff, and after a great deal of effort and correspondence, they advised us that the regulations did not permit it. We were, therefore, under the necessity of going up to the Secretary of War and getting permission for Colonel Gibbs and Major Ward to attend these conferences of the Standardization Division and for Colonel Gibbs to give us this address.

It is an old axiom that we value that most for which we have had to strive most. We, therefore, have great satisfaction in this opportunity to hear from the War Department on "Standardization as a Factor in National Defense." The man who will address us is a soldier—and soldiers, you know, are rated only according to their qualifications for fighting. Colonel Gibbs has a most enviable record as a fighter, as is indicated by his decorations. I do not want to embarrass him by my remarks, but these bars may not mean a great deal to you, not understanding them. If they were replaced by the decorations they represent, he would wear eleven national decorations, including one from the King of Belgium, one from the President of France, one from the King of England, one from the King of Italy, and all of the balance from the United States Government, including the Distinguished Service Medal. So he is a real soldier. (Applause.)

Col. Gibbs had a great deal of hesitation in coming before our organization and making an address, but we persuaded him to do so, and we are very grateful that he is here. Col. Gibbs. (Applause.)

COL. GEORGE S. GIBBS: Mr. Chairman, Members of the Conference: The Secretary of War has directed me to express to you his deep interest in the great work of standardization and to assure you how thoroughly its importance is realized by the War Department.

The Assistant Secretary, Colonel Wainwright, upon whom Congress has imposed supervision of the business features of the War Department, is not only an enthusiastic supporter of standardization, but may be depended upon to apply its principles in a practical way wherever it can be done. If it had been at all possible for him to have come out here at this time to address you, he would have given you those assurances in person.

During my attendance at the sessions of this Congress, both old friends and new acquaintances have said: "How does it come that *you* are attending a mining congress?" and "What is the interest of the *War Department* in standardization of articles connected with the mining industry?"

If I shall be able to tell you—and show you—how tremendously vital standardization, in its broadest application, is to the War Department, I will have fulfilled my mission here.

As we look across this broad land, and about the city in which we have gathered, the things that impress us most are the institutions that represent the growth and progress of our civilization. They are built of iron and stone and all manner of things that man has turned to his uses. They include family and social and civic standards and relations that represent generations of painstaking cultivation. Were all this wiped out, who knows whether or not it could ever be restored or how many centuries it would take in the rebuilding?

In order that it may progress along its course of destiny—in order even to survive its allotted time—this great Nation of ours must protect what it has gained. It must guard what it has built, and secure the freedom and opportunity to grow and build and live. That is *National Defense*.

Those rights and opportunities may often be secured, up to a

certain point, by diplomacy. But always when the issue reaches the stage of survival or extinction, the right to survive can only be assured by relying upon that second stage of diplomacy—the force of arms.

The essential needs of defense are men and supplies, or personnel and material. The men must be trained and have the will to win. The supplies must be suitable for their uses and adequate in quantity. That is where *standardization* comes in. It represents the difference, on the one hand, between being able to get the needed quantities of uniform articles of tested usability, and on the other hand, or of being restricted and harassed by a hodge-podge of varieties the usable quantities of which are always insufficient.

The importance of standardization of war supplies cannot be exaggerated. In these days war involves the united effort of an entire Nation and the combined employment of all of its principal industries. How is it possible to harmonize the use of thousands of articles to a common end except by the adoption of a far reaching and effective program of standardization.

Perhaps the most crying need for standardization is in machines — machines for making articles, and particularly machines for making other machines. Those of you who buy and use machinery are only too well aware of the truth of this statement, and this brings up the question of a foolish and wasteful conflict that is the greatest enemy of standardization.

Just after the Spanish War, more than twenty years ago, a determined effort was made to bring about the adoption of standard containers for medicines. Types of bottles were devised that were ideal from every standpoint. Measures were blown in the glass at no additional expense, and the shapes were right for economical and safe packing. Their adoption was resisted by the big manufacturers who insisted upon putting out their products in hundreds of varieties of bottles of peculiar and distinctive shapes. It is needless to point out the wastefulness of this practice, and I believe that it is equally misguided, as it should be possible to make labels and wrappings that would serve the purposes of individuality and attractiveness.

The Government once bought meteorological instruments from a maker who purposely used a foreign screw thread, so

that simple brass screws needed for repairs had to be bought from him, and him alone.

A certain manufacturer of shoes in this country recently reported that he had in current use more than ten thousand different shoe lasts. Five hundred lasts, or one twentieth of that number, would provide shoes to fit every man, woman and child in America, and allow several styles for selection.

Manufacturers are today paying large salaries to clever men whose sole mission is to produce articles and variations of articles that are utterly different from those obtainable elsewhere, the use of which cannot be combined with the use of any other article.

As a money making proposition, this is of doubtful utility. In the larger markets of the world buyers cannot afford to purchase articles that become useless unless a single, distant maker can be reached.

These examples will appeal to you from a business standpoint. From the standpoint of National Defense the use of non-standard articles produces incalculable waste of money, and what is worse, it wastes time that is precious and jeopardizes the success of an effort upon which our very existence may depend.

The fight against this thing is your fight, both as business men and patriots, and to make headway you will have to be very aggressive and very industrious.

It is not to be expected, nor do you want your Uncle Samuel to go so far in paternalism as to take this matter out of your hands.

Right here I wish to add an observation that has come to me during my attendance at these conferences.

I have been impressed with the earnestness and enthusiasm of some of the Committees and their members. They are undertaking work that they can ill afford the time to do, and generously propose to continue it. But, it seems to me, this method of procedure alone will not produce results as fast as the need for progress in standardization demands. This volunteer work is all right—it is needed especially because it enlists the participation of the men who know the industry and its needs better than any others, and whose services can not be hired.

Should this not be supplemented by a small professional standardization group that will devote 100 per cent of its time to that work, co-ordinating and speeding up the work of committees and sponsors, and getting actual results in a few weeks that would otherwise take two or three annual congresses to complete? What do you suppose the American Engineering Standards Committee would accomplish if it were not for Dr. Agnew, the Secretary, and his very limited office force?

On seeing the scope of the work undertaken by the Mining Congress, I asked why that body was doing it instead of the Institute of Mining Engineers, and was told that the Mining Congress had taken it up because the Institute of Mining Engineers had not accepted it as its responsibility and was not making headway.

What body does it is not so important, but it is necessary that all of the work shall head up into one controlling center, and that there shall not be division and pulling at cross purposes.

Either one body should do all the work, or complete co-operation effected.

Since writing this I have, of course, listened to Col. Roberts' statements or explanation of the correlating committee. They do, in a measure, cover what I have pointed out in these remarks, but they do not cover the one feature that I tried to bring out here, and that is of having a secretarial or professional standardization crew on the job to work night and day, if necessary, so as to get results so that we can have them while some of us still live rather than in the far distant future.

The War Department is not only supporting the efforts toward the adoption of national and inter-national standards, but has gone much farther. The Secretary of War has directed that American Standards, when adopted, shall be incorporated in all specifications of articles of supply to which they pertain. He has also directed that in the adoption of articles for military use, the standard articles of commerce will be selected when they are at all suitable for the purpose, and that special types be avoided whenever possible.

In this connection, I wish to say that before we went into this war you could have taken a thousand-dollar bill in one hand and a galvanized Q. M. bucket in the other, and you could have gone through this country and you couldn't have gotten a

galvanized bucket according to the government specifications—not one—with your thousand-dollar bill. Of course, the War Department was at fault in having an article so special as that. On the other hand, the industry was equally at fault because when we had to have buckets in larger quantities we went out and tried to get them, and there weren't buckets that were at all suitable in sufficient quantity to supply anywhere near the demand.

The organizational arrangement in the War Department for determining types of articles of equipment and supply and for preparing specifications therefor is rather cleverly worked out and I am sure that it will interest you.

First: The users, the troops themselves as represented by the Chiefs of the several arms, make known what they want. Conflicting views are co-ordinated by the General Staff.

Second: The Chief of the supply branch responsible for procuring that class of article has the research and engineering work done and samples prepared. The type receives final approval by the Secretary of War and the article is prescribed in equipment tables.

The final preparation of the specification that becomes the basis of procurement is the responsibility of the Chief of the supply branch. Each such branch has a technical committee charged with preparing and carrying out a definite program of preparing specifications of all articles procured by that branch. This is a task that will take years to complete.

A representative of each using or interested service meets with this committee in order to see that the interests of his service are taken care of. When complete agreement is reached, the Chief of the supply branch may approve and publish the specification without further action or approval. If there is a disagreement, which rarely occurs, the matter is sent to the General Staff for adjustment.

As you doubtless know, there are seven Supply Branches of the Army. The Quartermaster Corps procures all equipment and supplies for its own activities, and all general supplies of a commercial character. The Ordnance Department procures guns of all calibres, ammunition and other articles classed as ordnance. The Medical Department, Corps of Engineers, Sig-

nal Corps, Chemical Warfare Service, and Air Service procure the special articles that pertain directly to their several functional duties in the Army.

Congress has recently provided that the Assistant Secretary of War "shall be charged with the supervision of the procurement of all military supplies and other business of the War Department pertaining thereto and the assurance of adequate provision in the mobilization of material and industrial organizations essential to war-time needs."

Thus the *business* features of military supply are grouped under one supervising head.

The *military* features are worked out by the General Staff. They include *what* articles are needed, the *quantities* required, *when* they are needed, and *where* they are to be delivered.

It requires no imagination to see how tremendously both the business and military interests of the War Department can be assisted by standardization.

All the agencies described are keenly alive to it, and it may be safely predicted that business firms dealing with the War Department will find a steady and gratifying improvement in the clearness and simplicity of its requirements. The principle of standardization is likewise being extended to its business methods—particularly to forms of contracts.

There are many obstacles that prevent the War Department from acting as sponser in initiating standards in commercial articles. It is perhaps well that this is so, for the leading position in that field belongs to the great industrial and engineering bodies of the country.

The War Department acknowledges its position as a grateful beneficiary, and begs that you who are the real leaders in standardization will put forth an extra effort as a contribution to patriotism. In achieving commercial supremacy you can by the same means and at the same time, add security to the National defense.

CHAIRMAN ROBERTS: I think you will all agree with me NOW that when Col. Gibbs told me he was *only* a soldier he was deceiving me. (Applause.)

I cannot refrain at this time from improving the opportunity of replying to the most excellent suggestion that the Colonel has made regarding our voluntary Standardization organization. He has

analyzed the situation correctly; it would take us a long time to complete any standardization program by our present method, but we are employing the only forces available—the voluntary services of the men in the industry interested in standardization. I agree with him entirely that if this program is to be completed in the near future so that we who are living shall reap the benefit of it, and not our children, we must have a regular paid organization to do this work.

One more fact: If we are going to keep our place, even our present place in the commercial world, we will have to speed up our standardization work very materially.

I would like to just take a few minutes to tell you what our neighbors across the sea are doing on standardization. They have already completed a program that will take us a long time to equal. There are fifteen national bodies on standardization in Europe—*national* bodies, please note—that have this work under way. Great Britain and Germany are foremost with these organizations. Great Britain's organization is twenty years old. They have been actively engaged in standardization work for twenty years and they have completed a program that will take us years to reach with our best efforts. They have already produced 150 national standards, and they use specifications from these standards, applying them to their foreign trade, and they translate them into languages all over the world. Great Britain today expects to maintain her commercial supremacy largely through standardization of her products. Germany's organizations on standardization are only four years old. These organizations were built up during the war, trying to hold together her commercial institutions, but already she has produced one hundred and fifty national standards, and has five hundred tentative national standards—that is, they are on trial for a year or so, and then they are revised and made national standards.

They have a journal on standardization published semi-monthly that has eight thousand circulation. They also issue loose leaf specifications for any particular article which has been standardized and they sell to the manufacturers of Germany every month, 100,000 specifications of that character. There are 5,000 industrial firms in Germany that are supporting their national standardization movement. Germany hopes, through standardization, to regain her commercial supremacy, as well as rebuild her industries at home.

So much for our competition abroad. At home we have a

national standards organization, referred to by Col. Gibbs and some of the other speakers, as the American Engineering Standards Committee. This committee has only barely begun to function, and its support by the industries of this country is still so meager that the staff is necessarily small, and what they hope to accomplish until they are supported more largely by the industries of this country will not enable them to in any way compete with these foreign organizations. It certainly is time that American industry awoke to the value of standardization.

This completes our program for this evening. We thank you very much for coming out and listening to our rather technical subjects.

SECRETARY CALLBREATH: May I say a word before we adjourn? As has been said by your chairman this evening, there must be help given to him in this work. I assume that the work which Col. Roberts has done for this purpose and this cause this year could not have been hired from him for half the total income of the American Mining Congress. We shall not be able to hire any one to do work to be compared with that which he has accomplished. I want to pay this tribute to him publicly—that no man has ever served the Mining Congress' aspiration so loyally, so faithfully, so earnestly, so continuously, as has Col. Roberts. (Applause.) We hoped a year ago to be able to hire for him an assistant who under his direction could perform much of the detail which he has been forced to attend to himself. Unfortunately, we were not financially able to do it. I hope the coming year we shall be able to provide for him whatever corps of assistants he desires and to any extent that he desires such assistants, and we shall only hope that Col. Roberts will continue to give us enough of his time to direct those assistants.

It is to me a very great personal pleasure and satisfaction to acknowledge his loyal service to this work, and to recognize the value of his recommendations among which not the least of is that which calls for further support for the American Engineering Standards Committee. I believe that we should do our part toward making that committee able to do its part in the bigger, broader work which covers the standardization of all industries.

This is indeed an important work and we must not neglect it. I feel sure, or at least I feel hopeful, that within the very near future we shall be able to provide the means by which Col. Roberts may

be supported and Col. Mitke, heading the other branch of the committee, may be supported, so that each shall have that assistance which is essential to help them carry on this work.

I thank you, and I hope that you will tender to Col. Roberts now the full endorsement of his efforts. (Applause.)

A motion was duly made, seconded and unanimously carried to extend Col. Roberts a rising vote of appreciation.

The meeting adjourned at nine forty-five p. m.

SIXTH GENERAL SESSION

FRIDAY MORNING, OCTOBER 21, 1921

The meeting convened at ten-fifteen, President Loring presiding.

PRESIDENT LORING: I will now declare the Sixth General Session of the American Mining Congress open for business.

We will have the report of the Resolutions Committee.

MR. JOHN STEELE: The Committee begs to report on the following resolutions:

RESOLUTION NO. 1

Introduced by the Gold Conference

WHEREAS, the purchasing power of foreign countries has and will continue to diminish with a continued loss of gold to the United States, and

WHEREAS, our export trade upon which the prosperity of the nation, and especially that of the agricultural and mining industries, so greatly depends, has been and will continue to be curtailed because of this condition, and

WHEREAS, the restoration of our export trade depends upon the restoration of the currencies of foreign countries to the gold standard par and the return to the normal purchasing power which would result and

WHEREAS, the present system of conducting exchange transactions with the attendant difficulties arising from speculation in the currencies of foreign nations is not scientific, and if continued will further delay the financial recovery of the world, now, therefore,

BE IT RESOLVED, that the American Mining Congress in convention assembled hereby expresses its appreciation of the special activities of the Hon. Tasker L. Oddie, U. S. Senator from Nevada in support of the Gold Standard, and, pledges its earnest support to the principle that the gold consumption in manufactures and the arts should be curtailed and the production of new gold stimulated, thus safeguarding the maintenance of the gold standard and the monetary gold reserve of the nation from further industrial depletion; and,

BE IT FURTHER RESOLVED, that this Convention endorse H. R. 8404 introduced by Representative Louis T. McFadden, Chairman of the Banking and Currency Committee, of the House of Representatives providing for a conference of the representatives of Great Britain, France and the United States to investigate the subject of exchange stabilization with a view of determining the means which may best be employed to remedy the present chaotic condition of the exchanges; and,

BE IT FURTHER RESOLVED, that a copy of this resolution be sent to the President of the United States, the Secretary of the Treasury, the Comptroller of the Currency, and to the members of the Senate and House of Representatives of the United States.

MR. STEELE: Mr. Chairman, this resolution was approved by the Resolutions Committee and I move its adoption. The motion was carried.

MR. STEELE: Resolution No. 5.

RESOLUTION NO. 5

Introduced by the National Tax Conference

RESOLVED, that this Conference register a vote of thanks to those members of State Tax Commissions who have been good enough to take their time and give their efforts in presenting to this conference so carefully the subject of the taxation and revenue systems of their respective states, from which we have so greatly benefited; and

BE IT FURTHER RESOLVED, that the Committee on Resolutions of The American Mining Congress be requested to spread this vote of thanks in the proceedings of The American Mining Congress in behalf of this division.

MR. STEELE: I move the adoption of that resolution.

The motion was seconded and carried.

MR. STEELE: Resolution No. 4.

RESOLUTION NO. 4

Introduced by the Tax Conference

RESOLVED, that the President of The American Mining Congress appoint a committee of not less than ten, with authority to increase its number, to study the question of state taxation of mines within the several mining states of the Union and report to the Secretary of the Congress as soon as practicable.

MR. STEELE: Resolution No. 2.

RESOLUTION NO. 2

Introduced by Wm. J. Loring of California

WHEREAS, the mining industry is confronted with special problems due to the consequences of war and the present urgent requirements of readjustment, the solution of which could be greatly facilitated by Cabinet representation for the mining industry; and

WHEREAS, the employment of nineteen million wage earners of which some five million are now out of employment is dependent directly or indirectly upon the products of the mines, the implements of agriculture, the machinery of industry and the tools of trade; and

WHEREAS, the agricultural industry, in 1889, when a Cabinet representative for that industry was appointed, had a total value of production of less than two and one-half billions of dollars, while the mining industry had during 1920 an estimated value of production of over seven billion dollars; and

WHEREAS, the American Mining Congress has recognized the need for the creation of a Department of Mines and direct Cabinet representation for the mining industry, throughout the twenty-four years since its organization during which period this organization has endorsed many bills which have been introduced in Congress for this purpose; and, therefore,

BE IT RESOLVED, that The American Mining Congress in the 24th Annual Convention assembled at Chicago, Illinois, hereby endorses S 1957 introduced by Senator Samuel D. Nicholson of Colorado, which centralizes all Governmental activities related to the mining industry in one department to be presided over by the Secretary of Mines who would be a member of the President's Cabinet, and

BE IT FURTHER RESOLVED, that a copy of this resolution be sent to the President of the United States, the Secretary of the Interior, and to the members of the Senate and House of Representatives of the United States.

MR. STEELE: I move the adoption of that resolution.

The motion was seconded and carried.

SECRETARY CALLBREATH: Mr. President, I am advised that Senor Rubalcaba, the Assistant Secretary of Commerce of the Republic of Mexico is to speak to us this morning and finds it necessary to leave on an early train, and I beg to ask that the further report of the Committee be suspended until Mr. Rubalcaba has addressed us.

PRESIDENT LORING: Ladies and Gentlemen, the first speaker on the program this morning will deal with "Opportunities for American Organizations in Mexico." Hon. Luis N. Rubalcaba. (Applause.)

MR. LUIS N. RUBALCABA: Mr. Chairman, Ladies and Gentlemen: If you will read the program my speech was intended to be delivered this afternoon at two-thirty but I have to leave this morning for Dallas where the President of Mexico has appointed me as a personal representative to assist in a big banquet given by the Dallas people to Mexico and I have to represent him, so excuse me for speaking before the time set by the program.

I thank you, Mr. Chairman and all the members of the Ameri-

can Mining Congress, for coming to this place and listening to what I am going to say.

When the first program was delivered to me the subject on which I was supposed to talk was "Development in Mexico." Now when the final program was made, I found a different subject, which was "Opportunities for American Organizations in Mexico."

Well, as you understand, I cannot talk very long about this matter because it would take a book or several volumes to speak of the opportunities of American corporations in Mexico.

What I wish to do is to give you a general idea of the conditions of the country that have been always misinterpreted, and I am going to do this, just make a kind of comparison of your conditions here in this country and the conditions in Mexico, so you can understand them better.

In Mexico we have a very peculiar social and economic condition. Mexico as you know is composed of different groups of people—Indians, descendants from the Aztecs, who lived in Mexico, have been living in the country for centuries, who were civilized at the time when the Spaniards came to America, who founded big cities. For instance, you still find the big pyramid about twenty miles South of Mexico City and under that pyramid you will find the ruins of three cities.

We have, as I was saying, three groups—the Indians, coming from those Indians that have been living in the country for many, many years. We have the descendants of Indians and Spaniards who came to conquer Mexico, and foreigners. You in this country don't have those groups. You have Indians, but you have them in the reservations, set apart from the mass of the people. We have the Indians among us, they live with us, they live in the cities with us. I have seen them several times in the states representing Mexican ladies.

I was in Dallas about a month ago. Mr. Bob Knight (maybe some of you know him), a leading attorney in Dallas, made this remark which impressed me very, very much. He said, "If you go to New York, for instance, you don't find the people in the Bowery going to Forty-second street. Never! They don't mix, and I have seen in Mexico the people of the lowest class in the country going to the best center in the town and mixing with the people."

Well, that makes a kind of contrast, you see, and leaves the foreigner to misjudge the people and misjudge about the conditions of the country.

I said this because my country as you know has been misinterpreted. The general impression is that in Mexico we have got nothing, we have no industries, that we know nothing, we don't know how to live, we don't know how to talk nor how to dress, that everybody wears a big gun there and fights. That is the only thing we were supposed to like to do and were able to do, but no, gentlemen, in Mexico, as in any other part of the country, you will find criminals, you will find bad men, but you also find good men, refined men, men of intellect, men that know how to speak, how to do things, how to manage big enterprises, but the trouble is that the big majority of the people have no education. I must frankly confess that. If you go to Mexico you find the lower class in a pitiful condition. Why? Just because the governments from the time of the Spaniards up to the present administration that is trying to do the best that can be done towards a new movement for the development of the country have done nothing to develop the minds and the social and the economic conditions of the poor people.

Here in the cities you find, for instance, the mayor of the city always trying to do something to help the poor, to help the people without any labor. In Mexico for centuries nothing has been done to help the poor, to help the people. That is the main cause of all the unrest and revolutions that we have had in Mexico, they have been due to social and economic conditions more than anything else in the world.

Let me make another comparison that will explain more clearly my idea. In the states you are fighters, you like to fight, but you like to fight for the dollar, you like to fight for the control of the money, for the control of power in business enterprises, and in this big city—Chicago—and in any other city in the state you notice a struggle for life. As you call it the tendency is to do business, to go ahead all the time and life is a struggle itself, you know that as well as I do.

Well, in Mexico, owing to the social and economic conditions, as I have explained to you or tried to explain, people are fighting also for supremacy, for money. Sometimes if you offer a poor man that has never had a dollar in his pocket, a gun, a

horse and something to eat he will follow you. He is not a revolutionist, he is not a criminal, but give him something to eat, he wants to fight for life just as you do in this country.

This tendency to fight for something is general. In this country you fight for business, as I was telling you. In Mexico sometimes we have to fight for something else, for supremacy, for power, which means the same, but don't make the error to think that we want to be criminals, that the majority of the people are criminals. No, they just fight because life is a struggle as it is here, as it is in China, South America or Europe. Everybody has to make a living and has to fight for it, and bless you, Americans have to struggle, to fight only in the ranks of business for your commodities and for better positions in life. We should like to do the same and we leaders of the Mexican people should like to see the Mexican people go at it in the same way.

You may suppose that I am very far from the subject of my speech. The subject is what the opportunities of American enterprises are in Mexico. Opportunities for American corporations in Mexico are wonderful. Every paper knows and every paper has printed that Mexico is full of natural resources. You find there, as you know very well, oil, any kind of mines, every product in the world can be found in Mexico.

What has an American corporation to do? Just go to Mexico and find the same protection as any other corporation in the country. Just go there and find out the conditions. I am telling you all these face-to-face and heart-to-heart . Just go there and find out really what the conditions of the country are and you will realize that you will find no other country in the world where you can make money more easily than you can do it in Mexico.

What are the responsibilities for the people going to Mexico? Just take care of the people who work for you, just pay a little attention to the poor laborers that haven't got any education. It isn't our fault, I mean the fault of the present government, it is the fault of generations. Just go there and give them good treatment and try to help them out and they will love you and they will work for you like laborers.

Don't hesitate to go to Mexico. Lots of delegations have been in Mexico recently, as you may know. People from St.

Louis, from Dallas, from El Paso, from California, from Massachusetts have been in Mexico. We have been trying to show them what the conditions of the country are.

If you go to Mexico you will find the President a man who is trying to do his best to help the country out. It is a great task, it is an enormous task. He will be able to do something. You Americans must go there and find out the conditions of the country and feel at home and help us as we Mexicans who work for you in Mexico try to help you. You need the natural resources of Mexico; we need the money from the states. You bring the money to Mexico and we will give our natural resources and our labor, but don't forget that if you go to Mexico, the only thing that we ask from you is to just give a little assistance to the poor, just give a little help to the laborers and do not misjudge them because they are not educated, because they haven't got the opportunities that the lower class of this country have. In this country everybody knows how to read and write. In Mexico there is a vast majority of the people who do not know how to read and write. Do you expect people who do not know how to read and write to be on an equal level with you people? Of course not. Don't forget that those people like to work, are kind hearted. They love you, they like you all when you treat them right. You will find, for instance, in Tampico that the American industries have done wonderfully, have improved the city and maybe they have done a little toward the improvement of the lower class in the city. Perhaps you saw that moving picture at the Coliseum the other night. The name of the picture was, "Mexico and her oil." If you saw it you noticed that side by side with wonderful residences you saw little shacks where the poor laborers lived. Well, they need just a little education. We have had an education. I have been at the University of Mexico. I know how to live and how to talk to you and just how to converse, but they don't know, and don't make the mistake of taking them for criminals or bad people or something like that, for they are kind hearted, good men, easy to handle when you know how to handle them and how to promote their good feeling towards you.

I am sorry I cannot say a little more but my train leaves in a few minutes. As I told you, I could speak hours and hours on this subject. I would tire you certainly if I did that. However,

what I have said is the truth; it comes from the bottom of my heart and is said with the idea to convey to you a real truth about Mexico.

I thank you very much, Mr. Chairman and all the members of the Congress, for having given us a space in the Coliseum for our exhibit. We sent an exhibit here just to show that we are on a normal basis, that our life in Mexico is normal again, conditions are favorable and improving all the time.

Just one other remark. Just a few weeks ago two delegations from Mexico went to the Pan-American building in Washington (I have not been in Washington myself) and they found among the coins that we have in Mexico different papers this big (indicating) saying, "This is the only currency they have in Mexico." Well, that is not true. It is true that we have not the banks in shape yet, we are trying to get them in shape, but I am going to show you, for instance, the latest coin that has been put in circulation in Mexico. It is a twenty-five dollar piece. That is the only money at present that we have—gold. This is a fifty peso or twenty-five dollar gold coin, and I am going to show you, for instance, a ten peso, equivalent to five dollars. This is a five peso, equal to two and one-half dollars. This is a two and one-half peso. Our business is normal. We have gold in circulation, so don't be afraid to go there. You will change your bills and you have gold in your pockets instead of bills. I don't say that gold is good, I don't say that the bills are bad; I have some in my pocket, but gold is good, too. (Laughter.)

I am presenting this coin to Mr. Loring in token of my personal appreciation to him and all of the gentlemen of the American Mining Congress and you people of Chicago.

Thank you. (Applause.)

DR. PAYNE: I would like to move a rising vote of thanks to the representative of Mexico for his very interesting talk and for the exhibit which his country has sent to the Coliseum and which is one of the most interesting there. It so happens that I have just returned from two months in Mexico and I can endorse every word he said. I move a rising vote of thanks to the gentleman from Mexico.

The motion was seconded and a rising vote of thanks was extended to Mr. Rubalcaba.

MR. RUBALCABA: I will say good-bye and good luck to you all. Thank you very much. (Applause.)

PRESIDENT LORING: Ladies and Gentlemen: "The Importance of Developing American Interests Abroad," will be dealt with by Mr. E. M. Herr, President Westinghouse Electric and Manufacturing Company. Mr. Herr. (Applause.)

MR. E. M. HERR: Mr. President and Gentlemen of the Mining Congress: I assure you it is a very great pleasure to come before you this morning and say a few words on the foreign trade situation as it affects our industry. I myself am a manufacturer and will probably speak somewhat from that standpoint, although it is not with any idea that the manufacturers are of any more predominance or importance in this great industrial situation than the mining people.

I welcome indeed this opportunity to say a few words to this group who represent so very important an industry.

The teachings of history, if properly interpreted, are the best guide to future developments. It is, therefore, important, if not absolutely essential, before attempting to reach conclusions as to the effect upon our domestic industry of our commercial relations with foreign countries, that we first consider, briefly and hastily through necessity, what has been the history of the commercial development of our own and other important industrial nations during the past century.

From about 1830 to the beginning of the World War, Great Britain was the acknowledged leader in the commercial and financial world—in fact, after the Napoleonic wars, London became the financial center of the world and energetic Englishmen rapidly extended their trade relations to the remote corners of the earth.

The fact that her bankers had loaned vast sums to all her allies against Napoleon and that as a nation she was the least injured by these wars was largely the cause of her financial power and the position she later attained as the world's financial leader.

The rapid expansion of England's profitable trade throughout the world caused precious metals to flow into London from the people with whom she traded. With a fairly large accumulation of gold in her banks, England definitely adopted the gold stan-

dard in 1818. This was, under the circumstances, a master stroke of policy for at the time and for a number of years thereafter England was the only country whose money had a fixed value. The United States of America, France, Prussia, Russia and practically every other country in Europe had then little or no metallic circulation.

This situation is closely paralleled today when the United States occupies the position then occupied by England, the countries of Europe, including England, having practically no metallic circulation. We are also now, as was England then, the great creditor nation of the world.

England's predominant financial and commercial position during the latter part of the 19th century was not due entirely nor even principally to the adoption of the gold standard: it was due to a much greater extent to the activity of her people in pushing the development of her industries and of her commerce. Her insular location encouraged the rapid growth of her Merchant Marine. For some time the United States outstripped her on the sea, but when the change from wooden to steel ships was made, and especially steam-propelled ships, Great Britain rapidly gained on the United States in ocean transportation and from the period just preceding our Civil War until the World War, was decidedly the greatest maritime power on earth.

The history of England's commercial development also shows that in addition to being the great creditor nation of the world and mistress of the seas as well, she employed her financial resources to extend credit and to stimulate her foreign trade by making investments in the countries where business was to be done, using her banks to aid in her commercial growth by obligating those borrowing from them to use a large proportion of their borrowings in purchases from her people.

If such was the progress of Great Britain and the United States, what of Germany? For almost a generation before the World War, Germany was steadily building up her industries and developing her Merchant Marine and just prior to the war was making rapid progress in obtaining a most important position as an industrial and commercial nation. Her Merchant Marine was growing rapidly and had the war not intervened, this, together with her remarkable industrial growth, would

eventually have caused her to outstrip Great Britain as the foremost nation in the world's commerce.

The World War swept away her Merchant Marine, destroyed her financial standing, and placed such a burden on her industries that for a long time she will be at a great disadvantage in contending for the trade of other nations.

France, Russia, Italy, Belgium and the other belligerent countries have all suffered more or less seriously from the great war and while before that time not ranking commercially or industrially with Great Britain or the United States, are now much farther behind.

What about the future? Will the United States take the place formerly occupied by Great Britain in international commerce? Before attempting to answer this question, let us consider some of the situations now presented by our trade relations with other countries, especially the countries of Europe, formerly our best customers but now sadly shattered by the war. What is now their condition almost three years after cessation of hostilities?

Great Britain, while suffering no material property damage from military operations, sustained the dreadful loss of many of her finest men; much of her shipping was destroyed, and the interruption of upwards of four years in her enormous and valuable foreign trade resulted in great financial and commercial loss. Furthermore, her position as the leading creditor nation was taken by the United States. She has suffered severely from labor difficulties since the Armistice and is still industrially in an unsatisfactory position. While progress is being made, time will be required to bring about an entire return of her former industrial efficiency.

France and Belgium both suffered severely from military operations, the flower of their young and active men were killed or maimed, and large areas of their most valuable and productive industrial sections ravaged, with enormous material losses. They are financially burdened with very large public debts: their industries have been subjected to great losses, in some sections being entirely destroyed, while their external commerce was, during the war period, entirely ruined.

Both France and Belgium are showing remarkable progress in reorganizing their industries and commerce. Labor in both

countries is contented and diligently at work with most encouraging results. Production is good and a rapid return to normal productive efficiency is indicated. German reparations settlements should aid both these countries.

Italy is also returning rapidly to normal productiveness although greatly burdened by heavy financial obligations. She suffered comparatively little during the war from military operation, but rather more on the sea. Her labor, while greatly disturbed soon after the Armistice, has now settled down with promise of a steady and rapid return to full efficiency.

The other allies, with the exception of Greece, which is still unsettled, are all giving evidence of a gradual and steady return to normal conditions, although burdened with very large debts and a sad loss of their young and virile men, causing this return to be much slower than would otherwise be the case.

As to the Central Powers—the vanquished in the Great War—neither Germany nor Austria suffered from military operations within their borders but because of the provisions of the Armistice and subsequent Treaty severe economic conditions now prevail and in addition they must meet the drastic reparations requirements. Their economic and industrial recovery is contingent upon their ability to meet these requirements. Germany's Merchant Marine and Colonial possessions are gone, as is the valuable territory of Alsace and Lorraine, including her richest coal fields.

Mr. James G. McDonald, chairman of the Executive Committee of the Foreign Policy Association, in an able article in a recent number of The Annals, points out that in addition to the very grave question whether Germany can meet her reparation settlements on account of her present economic condition, the gravest question is what can the world afford to receive from Germany. The article discusses at length the amount and value of German products which the other countries of the world must receive if Germany makes her reparations payments in the only way possible—that is, in products of German industry, as of course they cannot be paid in money. It finally states:

"But it is obvious that the world will not give Germany a free field and that the United States least of all would be willing to do so. Is it not an open question, therefore, whether, from the point of view of American commerce and the revival of Amer-

ican business, Germany ought to be permitted to fulfill her reparations commitments."

It is then suggested by Mr. McDonald that the reparations settlements be spread over a longer period than is now required by the terms of the treaty, thus avoiding the too rapid building up of Germany's industries and commerce.

As to the vast Russian domain, the conditions there are too uncertain and too unstable to attempt a statement as to her internal situation. It is perhaps sufficient to say that the widespread famine existing in this land of boundless agricultural resources is due not only to the decided failure of the Soviet Government to cope with the situation but also to the absolute breakdown of transportation facilities, doubtless in turn due to a great extent to the inadequate organization of the Government.

In all European countries dollar exchange is very high, not only because of conditions resulting from the war, but also because this great disturbance in the exchange of commodities between nations has given to the United States, during and since the war, an abnormal position as an exporting nation. In South America, owing to the difficulties in Europe, dollar exchange is also at a high premium. The loans our banks are now making to the principal South American countries and the developing import trade with them will do much to restore a more normal rate of exchange and thus improve our opportunities for trade with our southern neighbors.

In the Orient and the other commercial countries exchange and trade conditions are more nearly normal, and it is in such countries that we should now have a great opportunity to expand our foreign trade, and we will do so more rapidly if we can overcome at home some of the fundamental causes which make our own commercial condition unsatisfactory—to which I shall soon refer.

With the above very brief sketch of the foreign industrial and commercial situation in mind, let us return to the question—"What of the future?" "What can the United States do to hold and strengthen her financial situation, and restore at least normal activity to her depressed industries, thus overcoming her present unfavorable economic condition?"

It is plain that Europe sorely needs all the financial and economic help we can render. Furthermore, because of con-

ditions there, the remainder of the business world, lacking the financial help formerly found in Europe, is turning to the United States for financial aid, especially by the extension of credits.

Under these conditions, why is there a business depression in this country? The fundamental difficulty is the lack of balance in the various parts of our business. There is no lack of capital available, no dearth of facilities or material for production, and no scarcity of plants in which to produce, but there is a lack of balance between the prices of our products and the wages paid to produce them. In some commodities pre-war or less than pre-war prices prevail while in the others the inflated war prices still obtain. Certain classes of labor are resisting any reduction in the inflated war wages, while in others almost complete liquidation of wages to nearly pre-war levels is found. The Railroad operatives, coal miners and to a large extent the building trades are holding out for the wartime wage. The public generally recognize that wartime prices must be reduced and the consumer will not purchase beyond his immediate needs until he feels that prices have reached or about reached their level. It is principally for this reason that the United States is depressed and will only return to full activity when the readjustment process is completed.

All resistance to the return to stable prices and costs only delays the return of prosperous times. This statement raises the question—"What are stable prices." History shows that after every great war the inflated prices and wages brought about by the large and unusual demands for all kinds of products during the war are gradually reduced until they reach a position of stability. This position is found to be never quite as low as before the war, but is only so far above the pre-war price as the progress made in productive efficiency during the period justifies.

In addition to putting our industrial and commercial house in order, we must recognize our obligation as the great creditor nation to take our place in the business world to which this position not only entitles but obligates us. We have in our vaults a larger supply of gold than was ever accumulated by any nation. To this vast store during the first seven months of this year upwards of $500,000,000 was added. Our mines, farms and factories have a normal capacity of approximately twenty per

cent beyond our own requirements, therefore a large part of our output must be sold abroad if our developed resources are to continue to be actively employed to their full capacity.

We have more than an abundance of the natural sources of wealth. In the production of grains, potatoes, cotton and other agricultural staples America is supreme. We have more than one-third of all the coal in the world within our borders while our production of this essential commodity is about one-half of that of all the other nations. We also produce about sixty per cent of the world's petroleum, the same proportion of its copper and nearly fifty per cent of its output of iron ore.

To our natural resources must be added our enormous industrial development, made possible and supported by the splendid system of transportation for which America is justly famous, comprising as it does nearly as many miles of main line tracks as all the rest of the world combined and much more than in all the countries of Europe.

Owing to the absolute dependence of our industries on transportation, our railroads must be maintained in a high state of efficiency and in continuous operation or our industries will be impotent—in fact, all our magnificent resources must be fully employed if we are to prosper and advance.

We cannot, however, hope to make the kind of progress our pre-eminent industrial facilities, natural resources and financial strength warrant unless we take our proper position as a leader in exploiting trade with other nations. Before a position of this kind is possible, the rank and file of our business men must learn much about foreign trade. Heretofore many of our people looked upon export sales as an expediency. When business at home was dull, a sporadic effort was made to sell goods abroad but on the return of prosperous times, the good home markets caused the export business to be neglected and of course it quickly disappeared, only to be cultivated again on the return of a period of depression.

No policy of this kind can reflect credit upon our commerce and no real progress can be made until we exporters make our foreign business as permanent and serious a part of our activities as is our domestic trade. Much study and persistent painstaking effort is necessary to accomplish this building up of a well-organized and effective export department. Representatives to properly serve our customers in the foreign commercial field

must be men of sufficient age and experience to have sound judgment in dealing with the foreigner and of a bearing and poise to command his confidence and respect. We must send such representatives abroad, not to stay a short time, devoted to securing orders, but to remain permanently in the country to which they are accredited; to become at home with those with whom they would do business, and by continuity of effort and intimate knowledge of their customers' needs, coupled with just and courteous dealing, really merit a fair share of their business, which will in this way readily be secured and a relationship established of great permanence and profit.

Our government has a duty to perform in establishing a well organized Commercial Department of our Diplomatic Service, consisting of commercial attaches and other necessary members. Those selected for this service must be trained and skilled men, chosen for their ability, and given an opportunity not only for continuity of service, if competent, but for regular and adequate promotion, as qualified. Properly developed, nothing our government can do will be more helpful than such an arm of our Diplomatic Service in the stability and welfare of our foreign trade.

As the creditor nation, we must arrange to extend loans in large amounts to the people needing them for legitimate enterprise and must purchase their securities. Fortunately, under the Edge Amendment to the Federal Reserve Law, our financiers are now organizing and developing corporations similar to the British Investment Trusts, some of which have been in operation for nearly one hundred years, during which time they have been very powerful influences and agencies in protecting and furthering Great Britain's trade in foreign lands.

It must be constantly borne in mind that the foreigner must sell as well as buy and that foreign trade is of necessity reciprocal. Under present conditions the foreign buyer is in great need of credit and provision for extending it is now of prime importance.

Let us recognize that never in the world's history has there been a nation with a future so bright as the United States. Our natural resources are unequalled; our industries better equipped and organized than those of any other nation and we have suddenly become the greatest creditor nation in the world. Before

the war we were obliged to pay to our European creditors an interest charge of about $500,000,000 per annum. Today they owe us interest in about the same amount. We will, therefore, receive, when the European nations are in shape to pay interest, about $500,000,000 annually in goods from them. Some manufacturers are alarmed at this and overlook the fact that increased imports do not necessarily mean decreased exports. Let us rather be mindful of our obligations as business men of this great resourceful nation and, putting our shoulders to the wheel of export trade, move forward with the determination to establish the United States in this great commercial field on an even broader basis than did our forebears in old England a century ago.

PRESIDENT LORING: Ladies and Gentlemen, the next speaker was to be the Honorable C. K. Leith who was to deal with "The Essentials of an American Foreign Mineral Policy," but he is detained and his address will be incorporated in the proceedings of the convention. The next speaker will be the Honorable C. A. Owen.

SECRETARY CALLBREATH: Before you introduce the next speaker may I read a resolution which ought to get to the Resolutions Committee so they will not be delayed. In the meantime, may I ask that any members of the Resolutions Committee here meet with the Committee at one-twenty. This resolution is introduced by the Arizona delegation.

(Secretary Callbreath read the resolution which was then referred to the Resolutions Committee.)

PRESIDENT LORING: We will now hear from Mr. Owen on "Competitive Costs and the Marketing of Mine Products in Europe."

MR. C. A. OWEN: Mr. Chairman and Gentlemen: The average person in the United States must certainly be confused by the complicated and generally unintelligible statistics and statements made and published from time to time of our exports, and more particularly our coal exports. We have been led to believe that the large and profitable export business of the past five years could be expected to continue indefinitely without the careful study of economic conditions both here and abroad and the working out of a broad policy necessary to its permanency.

The coal industry, like all others, has had attracted to it a

great number of speculators whose sole purpose was to make money while the high prices prevailed, without the organization and expense necessary to the building up of a permanent business. The situation here has not been unique, however, as in England, France, Holland, Italy and other European countries the same conditions existed.

The statistics given will be for Bituminous coal only, and as this discussion is limited to overseas trade I shall exclude tonnage exported to Canada, which amounts to approximately 14 million tons per year, and also tonnage exported to South America, Central America, Mexico and the West Indies, amounting to 3,500,000 tons to 5,500,000 tons annually during the past five years. This business should be retained by us at all costs and amounts to a total of approximately 18 million tons annually. (Bunker business amounting to six million to nine million tons annually, which we can expect to retain, is not included in this article.) Similar methods of marketing and cooperation by all concerned must obtain for these markets as for the overseas trade. Coal for export overseas originates generally from the states of Pennsylvania, West Virginia, Maryland, Virginia and Kentucky as the mines in these states carry the low transportation rates to tidewater. The railroads serving these fields have excellent port facilities for efficient loading of vessels. The present capacity of the railroads and piers is much greater than we will need if the loading demand is fairly evenly distributed throughout the twelve months of the year. These districts produce normally about 280 million tons annually and contain coals both low volatile and gas of superior quality which can compete favorably with the best coals produced abroad. During the year 1920 when we exported overseas about 20 million tons we drew from these districts approximately 7½% of the tonnage produced.

A comparison of figures of production and consumption of Bituminous coal of the countries comprising our overseas market, exclusive of Great Britain, shows a shortage of production normally of from 35 million to 40 million tons annually. Great Britain is our competitor for this trade. Great Britain's production varied from 287 million tons in 1913 to 240 million tons in 1920 from which was exported from 72 million tons in 1913 and 25 million tons in 1920. Our overseas exports of coal for

the same years were from 2,000,000 tons in 1913 and 20,000,000 tons in 1920, and for the seven months ending August 1st, 1921, about 8,000,000 tons, of which approximately 2,000,000 tons were shipped to Great Britain during the strike. During the month of September our overseas tonnage dropped to 300,000 tons. I have given you these figures to separate our overseas business from the total tonnage exported.

France has been the largest European purchaser of coal, consuming an average of over 15 million tons above production. The remainder of the normal demand is mainly in Holland, Norway, Sweden, Russia, Germany, Switzerland, Italy and Mediterranean countries. Europe will not increase its coal production above pre-war figures for a great many years, and I believe if handled carefully and intelligently we can do an overseas export business of from 10 million to 15 million tons annually of American coal. Our ability to retain this trade from year to year will, of course, first depend upon our being able to furnish quality, service and competitive C. I. F. prices. By furnishing quality we mean good grades of coal, well prepared, screened if so desired, and this quality maintained through shortage of production, giving the same attention to the foreign customer that we are giving to our customers at home, being willing within reasonable limits and tolerances to guarantee our product. There has been a great deal said about the dissatisfaction in Europe with the quality of American coals, but I find that generally the overseas trade which we have supplied like our coals and with comparatively few exceptions are satisfied with the quality of the product we have furnished. We cannot expect our foreign customers when paying railroad and water freights in amount three or four times the value of the coal at the mines to accept an inferior quality of coal. England has always recognized this fact and has given her export business the best grades of coal produced. The overseas market requires a great deal of large or lump coal and our important domestic consumers should be educated to the use of slack coal instead of run of mine, stokers being now generally used in our large plants. Service is most essential to the success of our overseas trade. Prompt, careful and intelligent handling of cables, orders and letters, accuracy and care in fixing of charters and dispatch in loading are all important. The foreign buyer

is very much more particular than the domestic buyer and not inclined to overlook errors or negligence on the part of the supplier. Here the English excel us because most of the exporting houses are old establishments with well trained employees, familiar with all the details of the shipping and export business and with a definite knowledge of how to please each customer. It must be remembered that few of the producers of coal in this country have had much experience with the laborious but necessary details of the shipping and banking business which are a part of every export shipment. Competitive prices are the most difficult, not so much on account of our production costs, but because of the many factors entering into the final C. I. F. cost. A comparison of mine or transportation costs from available statistics means very little as all prices are too unbalanced. The mine costs from the Eastern producing districts have varied from an average of about $1.00 per ton in 1913 to as high as $3.50 per ton in 1920 and are today approximately $2.00 per ton. Railroad freights are about double the 1913 rates. Ocean freights have dropped from a peak of $30.00 or more a ton to $5.00 a ton and all other charges including profit have varied accordingly. The value of our Bituminous coal F. O. B. Ports from which shipped 1913 to 1916 was about $2.50 a ton; in 1919, $4.70 a ton; in 1920 $8.00 a ton and today about $5.00 a ton. English coal for the year 1913 was valued at 14 shillings or $3.50 a ton while during the year 1921 to August 1st, the range of value was from £3 5s, or $12.35 a ton, to an average for the month of August £1 16s, or $6.85 a ton. These figures show our value at tidewater approximately $2.00 a ton below the English value, even with the English Government subsidy on labor costs and the practice of the English exporter to make the export price a competitive one at the expense of the domestic consumer. Costs during the past five years of English coal are exceedingly difficult to obtain and mean little to us. This fact, however, is clear—if England, by subsidy, whether it be on labor, on shipping, or otherwise, delivers its coal at a lower price than cost to the foreign market, then we must either do the same thing, or have an arrangement with England by which certain markets will be open to us with clean and fair competition based on actual costs delivered. If this is done we can easily compete successfully for a fair share of the overseas trade

which we need and should enjoy, provided our costs are brought down to a proper level. Coal costs C. I. F. depend largely on four items of which Labor makes up approximately 70% of the total. These are F. O. B. mine cost, railroad freight to tidewater, ocean freight and overhead charges and profit. Labor must be reduced throughout the Eastern districts as soon as possible to the 1917 level or lower, so that total costs F. O. B. mine will be not more than $1.50 to $1.75 per ton. Railroad freight rates should be reduced on coal for export to a maximum of $2.00 a ton, and while water freights are as low as possible under our present government regulations our laws should be changed so our merchant marine, which should be privately owned and managed, can compete under our flag with the ships of other flags. I believe it possible to reduce our rates from 50c to $1.00 a ton if restrictions are removed now in effect under the LaFollette law. Our quotations on good grades of steam or gas coal to Mediterranean ports are from $10.00 to $11.00 a ton as against English quotations of $9.00 to $10.00 a ton extra. You can, therefore, see that under present conditions it is very difficult for the American exporter of coal to compete with England.

I have great admiration for the English people but it is not clear to me why we should continue to finance England and allow her to use our money for subsidies which have the effect of excluding our coal from the European trade, thus driving our coal-carrying ships from the seas. If subsidies are necessary in order to allow us to compete, let us have subsidies in the form of reduced freight rates both railroad and ocean. Thus our mines will be given the extra work and our merchant marine which we should keep at all costs will operate.

Let us consider further our English competition. The settlement of the English coal strike in July was accomplished by the granting by the Government to the miners of a 10 million pound subsidy which was to be used for the purpose of paying labor a certain portion of the difference between the wage scale offered by the mine owners and that asked by the mine workers. At the end of three months operation mine owner is dissatisfied. The government fund is practically exhausted and the cost of coal to the English consumer has been too high. They have, how-

ever, regained their export trade and are now shipping to foreign markets three and a half million tons monthly.

The greatest factor against us in competition for foreign trade is the high value and constant fluctuation of the dollar in exchange. This adds actually almost twenty per cent to our delivered prices.

The principles of marketing coal for export are similar to those necessary to successful salesmanship in the domestic market. I am convinced it requires American management and as far as possible American salesmen. This necessitates the settling of our young men permanently in the centers of activity, learning to speak the native language fluently, becoming on friendly terms with the business men of the community, and becoming a part of the country. I think it better to have offices rather than agents and do as much business as possible direct with the consumer. This is a slow and tedious undertaking but certainly pays in the long run. Some of our most prominent exporters have followed this plan successfully and American coal offices can be seen in all the principal cities of Europe. English exporters have a decided advantage on account of the short distances to their European markets, and also because of prompt delivery. They can deliver coal to practically all European ports within ten days to two weeks of receipt of order. Our delivery requires more than double this time. The chance of fluctuation of exchange, or market prices is not so great. Another feature is the matter of small cargoes. Our deliveries are mostly in large vessels in order to get the advantage of low freights. Comparatively few consumers can handle this amount of coal at a time requiring the splitting of the cargo to two or more customers. The English cargoes are smaller, requiring less of this undesirable work and added expense. The greatest advantage at present, however, is the friendly status personally of the English manager who has established himself just as our managers must do. The problem of overseas coal exports is primarily ours, but as its success is of such prime importance to all, our government at Washington should co-operate with us so that the problems that appear from day to day may be worked out with its co-operation. The coal exporter must be encouraged and helped as the profit he receives will be small compared to the benefit to the country at large.

The banking business of the country must get a better understanding of export business and cease to be merely a collection agency. The information given relative to credits should be more thorough so that losses are a minimum and if credits are extended it must be with their help and co-operation.

The foreign branch of the American banking institution I believe an excellent thing and it is to be hoped that through this influence our people will invest more and more in foreign enterprises. Both Germany and England having shown what real value exports are to the people of their country, have in the past encouraged investment in the railroads, public utilities and industries of the country with which trade was desired. Their people become a part of the banking, industrial and social life wherever they are and one might say they are trading with their own interests. Financial interest in a project gives the investor a voice in its management and it naturally follows that through an advantage of this sort a great deal of the foreign business is done.

It, in a way, gives to the business men of the investing country the refusal of the business at the competitor's price. This has always been true of the export coal business of the principal industries of South America and governs a great deal of the European business today. As we encourage our industries to bid for foreign trade, investment of our money will naturally follow as our men become established and business will increase rapidly on this foundation. When we think of establishing an additional office in this country for the purpose of increasing our sales, the territory is first worked out carefully so as to be sure of sufficient business of the kind suited to the coals we handle to warrant the expense necessary to a permanent establishment. We next pick the man whom we think is best suited to this territory and certainly great care is used in this selection, as he is to be the foundation of the business. We then unpretentiously set out doing missionary work, getting acquainted, and during the first year do very little business. As our manager becomes acquainted, we form a banking connection in the city in which the office is located. In time our man becomes a member of the principal club or clubs, learns to know his competitors, the banking and business men of the district in which he has been placed, and at the end of two to three years is

firmly established and doing a profitable business. The sale of coal and American products in export trade can only be established permanently by this same method excepting the difficulties to be overcome are greater and the adaptation of our men to the situation more difficult. The whole problem becomes more complex and several years may elapse before the foreign branch is on a permanently paying basis.

During the year 1918 Congress passed the Webb law, allowing combinations in industry for the purpose of foreign trade. Several combinations have been formed under this law and meetings have been held by those interested in the export of coal upon the call of the Export Committee of the American Mining Congress. The coal trade failed to work out a satisfactory plan of organization and the matter was dropped. I believe this was a mistake. We should have co-operation either through a combination or pooling of interests or by the establishment of a coal export association composed of all those interested in coal exports. Such an association, with the help of the Export Committee of this body and the National Coal Association could accomplish great things in the working out of our problems and would be beneficial to all those in the industry, large and small. To the average producer of coal the export business interests him little. If he were to explain this lack of interest he would point to the small percentage of our production involved and the difficulties connected with the business. However, an overseas export of coal of 1½ million tons monthly would give employment to approximately 20,000 idle mines and more than one-fourth of our idle ships and would bring to this country in exchange for the labor and service $15,000,000 monthly. Not only would the coal trade benefit directly, but the business of the entire country would be accelerated.

Summing up we should have:

Reduced wages of mine workers and overhead costs.

Reduced freight rates for coal to tidewater for export.

A definite plan for payment of the Allies debts to United States, which will stabilize exchange rates.

A re-vamping of laws governing shipping so that ships under our flag can compete unrestrictedly with those of foreign flag.

Co-operation in the Coal Industry so that problems of the Export trade may be presented at all times as a unit.

Immediate action looking to a solution of these problems is necessary if we are to compete successfully in the overseas coal export trade.

PRESIDENT LORING: The next speaker will deal with "The Possibilities for the Development of a Permanent Export Market for American Coal." I have the pleasure of introducing Dr. Henry Mace Payne, of New York City.

DR. PAYNE: Mr. President, Ladies and Gentlemen: The hour is getting late. I want to be just as brief as possible. I want to predicate what I shall say upon two things: First, the report of the Export Committee of the Congress, which you will find published in the last convention number of the Mining Congress Journal. That sums up the efforts of my committee for three years.

The second basis for what I shall say will be the remarks of Mr. Owen who had just preceded me and I shall, therefore, attempt not to duplicate the very forceful statements which he has given you. Some of you may not know that Mr. Owen has just returned from several months abroad where he went in the interests of his own company and for the benefit of the mining industry at large—the coal mining industry at large—to give us the results of an extensive study.

I think I can say for my committee that we agree with Mr. Owen in every conclusion which he has reached. The Coal Export Committee of the Congress, as some of you know, is comprised of a representative of the operators, a representative of the leading exporters, a representative of the wholesalers and a member of the Bureau of Mines' staff.

We have endeavored in this way to cover every possible interest which can be concerned with the export of American coal.

The few remarks that I want to leave you are not argumentative. They are almost axiomatic. I think they may be said to be self-evident. I shall, therefore, present them to you as briefly and as logically and almost as epigrammatically as I can and you may draw your own conclusions.

It is my purpose to present as briefly as possible, a resume of existing conditions, and my conclusions based thereon. I shall dwell upon the European situation only as it applies to South and Central American business, as Mr. Charles A. Owen

has already covered in detail the problems which we must face to hold our European export trade.

Quoting from a recent address by Major General Leonard Wood: "The war is over; the struggle which is to follow has just begun. It is a struggle for commerce. In America we are looking upon such problems in a new light. The Administration is supporting and defending our overseas Americans with a definite foreign commerce policy, just as our competitors protect their nationals in foreign trade."

We have the coal. Our present productive capacity is approximately seven hundred million tons per year. Our normal consumption is five hundred million tons. A well regulated export market provides an outlet for this surplus in production which instead of creating a domestic shortage and high prices, as has been claimed by certain agitators, really enables the operator to keep his mines in continuous operation, furnishing steady employment, and lower costs.

American low volatile coal is accepted as the equal of the best Welsh coal. American gas coal is acknowledged to be superior to the best English gas coal, and commands a bonus of 50 cents a ton.

That there is an export market for coal is evidenced by the fact that during a recent period of production England exported two million tons in two weeks. If the price and preparation are right, American coal can be sold.

To do this, however, we must recognize the economic advantages which accrue to Great Britain and meet them by organized and co-operative selling methods, and by such reductions in cost of production and transportation as will enable us to quote ton for ton against competition.

Great Britain's coal fields lie close to the seaboard. Her regular imports furnish return cargoes and consequent low freight rates on outgoing vessels. In contrast to this, however, the man-production of British mines is only one-fourth that of American miners, and the bulk of British coal is hoisted, while the greater part of American coal comes from drift mines.

As a result, British costs must inevitably be higher than normal American costs of production. Against this we have transportation charges for 400-500 miles haul to seaboard, measured in cost by a $2 differential in inland rail freights.

The net result is an average British quotation 70 cents below the lowest possible American quotation in foreign markets.

To meet this condition a group of American exporters is now preparing an application to the Interstate Commerce Commission for a flat reduction of $1 per ton on coal destined to Europe and South America.

In 1914 the rate from the Pocahontas field to Hampton Roads was $1.40. This rate was raised to $2 and more recently by 40% additional, making the present rate $2.80. A reduction as indicated, to $1.80, would not only provide traffic at a fair rate, where none now exists at a prohibitive rate, but would enable us to underquote British bids by 30 cents.

There can be no objection to this from the operator's standpoint, since it would immediately result in the re-opening of many mines now closed and would assist materially in furnishing employment for many men now idle.

The requirements of South and Central America are approximately nine million tons per year, of which 40% is gas coal. No special consideration has been given to West Coast ports because the Panama Canal will enable us to meet Australian and Japanese competition with its inevitable long haul.

The next element for consideration is the question of credits. United Kingdom shippers have always extended 60-90 day credits to South American consumers, the largest of whom are public utilities, jointly owned by the municipalities where they operate.

Any American exporter in a position to furnish coal of recognized quality, good preparation, and in uniform cargoes, can finance his freight and shipments without difficulty through any of a number of reputable banking houses, whenever he can show a reasonable margin of profit. The reason such financing is impossible today is because with labor and transportation costs where they are, there can be no profits.

Because of the internal need for increased manufactures, England requires all her available capital, and is slowly withdrawing the support which she has been giving to the coal industry through subsidies, etc.

The time is propitious for responsible producers and exporters to unite in an intelligent movement for responsible rep-

resentation abroad, by men who know coal and who can meet consumers upon a basis of fair dealing and permanent connection.

The Webb Act has paved the way for co-operation. The pooling system can be successfully developed to guarantee rigid inspection and quality of product, and to minimize demurrage charges.

Given the proposed reduction in inland freight rates, reasonable labor costs at the mines, normal charter rates for ocean freights, and America can meet any competition in the world on export coal to the Mediterranean, Central and South American ports.

When this has been accomplished, the coal industry in America will have become more nearly stabilized, mines will be working more continuously, quality and preparation will be more closely regulated, and coal prices more nearly normal than ever before.

To this end the Coal Export Committee of the American Mining Congress, representing as it does the Producer, the Wholesaler, the Bureau of Mines, the Exporter, and the Banks interested in foreign trade—pledges its efforts.

PRESIDENT LORING: The meeting stands adjourned until two-thirty this afternoon.

The meeting adjourned at twelve m.

SEVENTH GENERAL SESSION

FRIDAY AFTERNOON, OCTOBER 21, 1921

The meeting convened at two-thirty, Mr. Geo. F. Bailey presiding.

CHAIRMAN BAILEY: Our first speaker this afternoon is on "Mining Opportunities in the Far East," H. Foster Bain, Director of the United States Bureau of Mines. (Applause.)

MR. H. FOSTER BAIN: I thought it might be interesting to talk a few moments briefly with regard to some of the problems with reference to mining in the Far East. The American attitude toward foreign mines and mining and minerals has changed. We have now a much keener interest in such things than we did have in pre-war days. This has grown out of our war experience in part and out of our trade situation at the close of the war. I think there is now a much wider appreciation than formerly of the important part that minerals bear in commerce and industry of the world. We have seen something of the necessity of having minerals in wide variety in considerable amount as a war measure and we are learning something of the important part which they bear in the balancing of trade as between different countries.

As a matter of fact, the minerals enter into our life in a variety of ways. First with regard to the domestic industry of any country, the minerals constitute a large part of the basic elements, the basic materials for industry, not only in that they afford the structural materials, the metals and the other things which are actually used, but also through the fuels they are the source of energy with which work is done so that it is vital to the life of any nation that they should have an adequate supply of minerals, and a reasonable variety in those minerals. If they do not have them within their own borders, they must have free access to them from outside of the borders of their country.

This particular phase of things before us now is one of the incidents to the Disarmament Conference or the Limitation of Armaments Conference, I believe it is better to call it, about to assemble at Washington. Among the problems which create friction between the different peoples of this earth is the problem of access to the materials which they must have to sustain not

only their national life but their industrial prosperity, and among the things which will necessarily be considered at Washington next month will be that very problem of access to these materials.

Another point of view which is rather new to Americans in connection with this is the necessity of freedom of opportunity not only for trade but for investment abroad. In the pre-war days we were all of us so much concerned with the development of our own country and we felt the need of additional capital so keenly that we did not realize and in fact we did not have the opportunity to realize the chance that there was for investment abroad. In the post-war period that matter of investment abroad has become more and more imporant. We entered the war with a very much larger share of the world's supply of gold than we had before, and that gold, if it be converted into terms of credit, and all put to work in this country without increasing the number of men who are due to work, would merely mean that we would bid against each other for the same amount of labor. We would raise prices indefinitely and get all out of line with the rest of the world. We must look forward to a larger basis for investment, we must find the place to put that money to work. In the past that gold was abroad and it worked abroad. Now it has merely changed ownership and the natural thing to do is to look forwrad for the reinvestment of a considerable portion of that money abroad and have it working for us rather than the other fellow.

The Far East is one of the regions where there is now opportunity not only for great friction but also it is one of the regions where industrial life as we understand it has developed to a lesser extent than in this country and in Europe. In the main the peoples of the Far East are still agricultural people. They have never put the natural powers or anything like a part of the natural powers under tribute as the peoples of the West have done. They have been said to take from the soils and in part to take the animals and to use them as a basis for life. They have not gone into manufacturing, they have not used fuels, they have not used water power, they have not even used the natural transportation agencies to the extent that we have, so that there is the opportunity there, at least theoretically, for the building up of a much larger and much more complex civilization than there has been in the past.

In the development of our own industries in the past we have worked on the basis of a constantly increasing per capita consumption for all of the common metals and we have looked forward to the time when the rest of the world would at least approach the American standard of consumption on these materials. It is that which has been our most hopeful feeling with regard to the demand for the materials which we as miners produce, and if the people of the Far East are to be educated up to anything like the same standard of consumption that the western peoples have. We will have there a tremendous market. If, on the other hand the peoples of the Far East are to remain upon their present basis of consumption, their market will mean nothing to us because their consumptive power is so small and because they themselves as units of energy in production are so small. They measure in small quantities, the man produces little goods, therefore he can buy and consume little goods and there is a great educational work to be done.

With this general introduction I should like to speak of the different countries of the Far East in the most broad and general terms to give you some idea of what the possibilities are. Siberia is one of the countries which is much in the public mind at present. As you all know, it is a large country, it is a country with a very sparse population and a country where the people that are there now are largely pioneers and are largely concerned with agriculture. Mining, transportation, manufacturing are all in the future in any considerable extent and the people who are there are merely farming or raising cattle and are living upon the proceeds of that industry. They are so few that they are not consumers in large numbers.

The possibilities of the country, however, are much beyond this. Contrary to general impressions, Siberia is a country of a very favorable climate. It may surprise some of you to learn that in Vladivostok they go swimming in the ocean in the summer time and wear white duck suits. The largest tigers I ever saw were caught within twenty miles of Vladivostok and there are in Siberia considerable areas where they have avenues lined with palms. That is not true around Vladivostok but it is true in Siberia. It is a country of varied climate and favorable climate. A great deal of Eastern Siberia is a country where the climate is no more unfavorable to general development than the

mountains in our own country. It is a kind of country where as an American travels through he thinks, "What a wonderful country this is for pioneering." As far as inherent capacity is concerned, there is the opportunity there for a large development of industry and of peoples.

The resources also are important. Eastern Siberia is one of the countries in the Far East where there is a supply of coal, and coal of a good grade, and coal near the shore, so that it may enter into the world's trade in considerable quantities. It happens that the better fields that are now known on the Island of Sakhalin are where we will have a serious marketing problem in that the ports are closed part of the year so that one must establish a business on the basis of the seasonal shipments. That, however, is entirely possible from a business standpoint if you had the proper consumption as is shown in the case of the development of coal mines in Spitzenberg where you have only a short shipping season. From Sakhalin you would have a long shipping season and a short closed season so that it is quite possible to do business there.

The Sakhalin coals are coking coals, which means a tremendous thing, because of the fact that in the East, as elsewhere, coking coals are relatively rare and it is not common to find coking coals available to transportation. Another one of the possibilities of that region is petroleum. The knowledge of petroleum is much more limited than of coal because coal sticks out from the ground and without being too definite or too certain about tonnages whereas the mere finding of petroleum does not give much idea as to the quantity. There is reason, however, to believe that some measurably good petroleum fields will be developed in that country when the industrial situation is favorable to it.

The big resource of Eastern Siberia in a mineral way of which we have all heard is gold and the gold which has so far been mined has been mainly placer gold. The Siberians have mined placer gold for many years. They have done pretty well in the mining of the gold along the creeks by the ordinary methods. Dredging is a relatively new industry, although there are now a number of dredges at work in Eastern Siberia. When I say "at work" I say it advisedly because they are at work even under present conditions. The gold region stretches south of

Siberia and into modern Manchuria, which was formerly under Russian control and in a corresponding belt to the west in Mongolia there are great areas with streams running out from them that have been placered and considerable unexplored areas so that we know that there are placer fields in there and there is a distinct possibility of finding even much larger placer fields than have yet been found and there are the possibilities of dredging in the lower grade fields.

These possibilities can not be taken as much more than possibilities in many cases since actual attempts to develop dredging fields have generally been disappointing and very considerable sums of money have been spent by people in the attempt to follow up from the gold placer workings of the Siberians and develop modern dredge fields.

I am not at all sure that that will be generally true but you can't jump to the conclusion from the presence of a large number of placers and a large number of unexplored areas that you will have great placer fields suitable for dredging. It is a possibility but I don't know that it should be more than that.

There is some iron known in Eastern Siberia. Very little is known about it. It has been unimportant. The opportunity for industrial development of it does not exist and has not existed so it has not been adequately studied. Whether or not there is the opportunity there ultimately for the development of an iron and steel industry is uncertain but certainly there is no reason to suppose that anything of that kind will develop within many years. The other minerals that are in the common field, lead, zinc and copper, are not known to occur in abundance in Eastern Siberia. There is an impotant zinc mine and there lead has been found in considerable quantities in at least two districts, but in general the more recent developments, the great deposits, are far in the interior of Siberia and all have reference in their development more to Russia as a whole and Western Europe than to any of the Far Eastern countries.

Siberia needs capital, it needs skill, and it needs most of all political stability, and until these things are supplied, there is no reason to anticipate any large development of the mineral industry of that country.

The next country which occurs to one is Japan. Japan has a very considerable variety of mineral resources, a tremendous

variety, in fact. Almost all of the things are found in Japan. They are not, however, found generally in large quantities. Perhaps that is because it has not been necessary in the past to develop large quantities but they find little, they find copper, they find lead, they find zinc and manganese, chromium and all the minerals and metals. Most of these are being mined to some extent. In copper Japan now ranges second among the world's producers and it has been an exporter of copper. They have done some very excellent work, both technically, that is in metallurgy and in mining in connection with their copper industry and that is a developing field. They have, however, an inadequate supply of coal and iron when you take into account their population and the strong urge that there is upon their people to develop into a manufacturing people. Their supply of iron is less than we ship in a single year in this country and their supply of coal, particularly of coking coal, is quite inadequate to any large development of iron and steel, so that they have before them the problem of getting supplies of these materials if they are to develop in the direction of a manufacturing and shipping nation, as seems to be their destiny.

It is probable, however, that the country as a whole will be more an importer of raw materials and an exporter of manufactured materials, than an exporter of the minerals and the semi-raw products. Japan is not a good field for investment because the Japanese have capital and they are developing technical skill and they have a very strong force to do their own developing so that there is not the opportunity for outside companies to go in.

The field is not absolutely closed by any means and there are American companies in the Japanese Empire that are working mines and have been making a profit out of it, but it is not a broad or an open field. The largest country in the Far East is China.

This is a country of very varied resources but the total of the reserves as far as we know them, are small in proportion to their population and, speaking generally, the part of the country which is open to observation and open to transportation now, or probable transportation, is a part of China where the mineral resources are less rather than greater than the average of similar areas in the world. It is not, in other words, a great treasure

house which is going to be opened up immediately upon access of people. It is also a country in which mining has been done for very many generations so that the things which the Chinese rule are valuable, which include practically all of the minerals that we mine, have been pretty well mined out from the outcrop and for considerable distances in depth. Coal, one of the things which they have known for many years, has been mined down to a considerable distance from the surface and this introduces a problem in the mining of coal because you are also working under old workings of which you have no maps and no knowledge whatever and there have been a number of cases of serious accidents and losses of life.

The Chinese people have a very low consumptive power for minerals. They are primarily agricultural people and not only that but they are agricultural people who are wedded to the raising of grains rather than to agriculture in a broad sense. For example, there is very little development of general husbandry. There is very little fruit development. They make little use of their rough lands, so unless they can get a piece of flat land or can make rough ground flat so as to raise rice on it, the land is pretty nearly useless to the Chinese. If they develop into the use of a larger number of resources and therefore produce more, they will have a larger buying capacity and will become important. As it stands today, China is an importer of minerals rather than an exporter. There is an actual annual deficiency in the supply of minerals and China buys abroad more than she ships of these things.

China has very large reserves of coal and coal of very excellent grade and wide variety. It is very widely distributed and it is one of the great coal reserves of the world, comparable to the coal fields of Canada and the United States. A great deal of the coal, however, is not well situated for present mining, that is the big fields are back a considerable distance from the ocean and there is no adequate development of industry in the neighborhood of the fields to permit the operating of large mines. There are a few coal fields which are near the coast and which by favorable situation have been developed on a considerable scale. Generally, too, the coal lies in a physical condition which makes it difficult to mine. It is along the flanks of the mountains. It has been badly broken. They have heavy

weights to contend with, timber is practically unobtainable, there are many difficulties of that sort so that mining coal in China is no easy job.

They have an excess of tin and are capable of shipping considerable amounts of tin so that we can look to China for a supply of tin which will enter into the world's export service. China also occupies a dominant position with regard to antimony. They have large supplies, it is well situated for mining and according to their methods of mining. They understand the treatment of antimony and they are in position to dominate the world's market in antimony.

Manganese is one of the things of which they have a supply and of which they are now exporters, but the probability is that if they develop their own industries they will need their manganese, so that personally I do not expect to see manganese shipped from China indefinitely.

Their iron supply is not much more than adequate for their own uses. In fact if they develop in anything like the same consumptive power as the rest of us, they will need more iron than they know anything about at present. The old idea that China contained one of the great reserves of iron ore is a mistaken one. It came about very naturally due to the fact that over large areas the earlier explorers saw them making iron and you can see them making iron today in a great many provinces but they make it in little furnaces that make about four tons in a year and to supply a furnace that makes four tons a year you can get along with a very modest deposit, but if you attempt to work deposits of that kind to get a supply for one of our large American furnaces, you just simply cannot do it. The problem of iron and steel development in China must be based upon the use of deposits which the Chinese themselves never used and had no use for, that is prior of course to the operating of the Hen Yan Works.

With regard to petroleum in China, there is nothing very definite or certain known. There are fields in which seaps are known. There are fields in which there are structures and there are possibilities of petroleum but there are great areas where one can say with that reasonable degree of confidence which comes to the man who has studied petroleum, that it is unlikely that they will find petroleum, so that is one of the unsolved

problems. And as far as the area easily accessible is concerned, it is one of the unpromising fields for investigation.

China, contrary to the impression that most of us have, does actually have capital. It is not available capital, however. It is capital which is in the form of silver, largely, which is buried, put away. In a single province in China one of my banking friends kept track for two years and he traced about $150,000,000 in silver in the provinces with a very small amount outflowing. In a samller period in the province of Shangtung in a period of two months he traced $15,000,000 in and three million dollars out, so the silver goes into the country and disappears. The reason for that is that the Chinese have never developed a system of banks in which they have confidence and they still have the old attitude which people of the world generally have, especially in areas of political insecurity, of being unwilling to take their money and put it to work. They don't realize that if you put it to work you can still have it. They haven't that sense. They are developing that, particularly in the ports, and in connection with foreign investments there is a considerable amount of Chinese money which is coming out and going into industry. There is a very interesting field there. It is a possibility that is quite large, and the various Chino-German, Chino-French, Chino-Japanese and Chino-American banks have the possibility of gathering up in China a very large amount of capital to be used in the development of China itself when they can establish confidence in themselves.

China lacks organization. It is a characteristic of the whole country. They don't understand organization in the sense in which it is customary with us. They do have organization and a most peculiar gift for organization in small units. Take a number of coolies with a pack train or to handle a lot of freight or anything of that kind and as they come into the compound or as they start to get the mules out in the morning, there is the most terrible confusion and yet suddenly somewhere or other without any apparent boss or sub-boss they fall in line and get it done, so in the organization of small units of work gangs they do very well indeed.

But in organization in the larger sense, anything above the village scale, either the village scale in politics or the corresponding scale in industry they fail. They fail for the reason

that through all the years of the past, for many centuries back, their idea of government as distinct from the village government has been the government of a conqueror. It is someone who came in from the outside and they throw the responsibility of government on that conqueror. They haven't then either that sense of confidence in each other or that accustomed sense of working together in large units which permits the organization of good management and it is one of the things which they will have to learn if they organize their own industries. There is, then, here an opportunity for foreign management and for the introduction of small amounts of foreign capital and the bringing out of local capital in the development of industry which I think will largely be needed for the development of their own country and will not result much in the support of mineral production.

I have the impression that as you develop production there you will develop consumption and that the things will be largely needed at home. The Chinese, of course, are one of the lands where they have so called cheap labor. In that connection, you as mining men who have had experience in various lands realize that cheap labor is very deceptive, that as a matter of fact so called cheap labor is not cheap labor, that when you take into account the extra housing, the extra superintendents, the extra breakage, the low efficiency, all of these facts, your labor costs are apt to be about the same under a given management anywhere. That is with good management you can take high priced labor and get your costs down as low as low priced labor.

So far as China is concerned, then, we do have the basic materials in the country, we do have the opportunity for development, and there is considerable amount of capital in the country if you could get it out, and they do need management, but there, as anywhere else, it is a case of very careful selection of the opportunity and your field. China can be self-sustaining. China did make trouble for her neighbors, but if she is going to take a large part in the world's life will have to learn much better management both politically and industrially than she has yet done.

Directly south of China is Indo-China, the French territory, inhabited, contrary to the general impression, by other than Chinese. In Indo-China they have zinc deposits with an excess

supply particularly of carbonate ore, which formerly went to Europe and in wartimes some of it went to Japan; and at present most of it is staying on the docks, as happens to zinc ore elsewhere, I believe. They also have phosphate deposits which have not yet been developed. They are not as high grade, so far as is known, as the phosphate deposits in this country. But in the Far East, with their devotion to agriculture, with the absence of mineral fertilizers, there are distinct possibilities in the development of phosphates, especially as you have sulphids of zinc besides carbonate of zinc.

Indo-China exports tungsten and a little tin. They have at least one large coal mine where they quarry the coal from the side of the mountain. It is an anthracite mine. It has to be briqueted to be handled in quantity, and it costs considerable; so far the costs have been fairly large.

In Indo-China there is a very natural preference given to French capital, and a very natural definite effort made to turn all the direction of trade towards France, so that the opportunity for outsiders is rather limited.

A more fundamental factor, I think, is this: It is a tropical country and the people are tropical people; they are accustomed to living upon what nature provides for them easily. They don't think of other things, they haven't the other wants and there is no very apparent reason why they should have other wants. They get the food easily, their housing is very simple and their whole scale of life is simple; there is not the same reason that urges them into manufacturing that there is with the Japanese. They have a much easier climate, and also another factor is that they are not so crowded in population; they have large areas into which they can expand. So that it seems less certain that there will be any very active or rapid development of the non-agricultural industries in that country, except as France uses it as a base of material for French industry in Europe.

The Philippines are a similar country to a considerable extent. That is, it is a country occupied by people who are accustomed to tropical conditions, who are not crowded as to areas, and who do not have any strong urge to change their habits of life. In the Philippines there are gold mines, placer mines and quartz mines. There are some possibilities of petroleum, now fortunately being tested. They have some rather considerable de-

posits of iron ore. The largest deposits of iron ore are the same type as in Cuba, which will require preliminary treatment in order to make a good furnace product and which you know has a serious disadvantage in use as well as in cost.

They do have some deposits of hard red hematite which may be quite important. So far as industry is concerned the Philippines lack coal, which is a very important thing. There are coal fields in the Philippines. Some attempts have been made to develop them, but they have not yet been very encouraging attempts. The coal is very badly broken, it is in a tropical country where it is difficult to prospect, it is not a very high grade at best, and it is by no means certain that they will ever have very much coal which they can use.

Across the sea from the Philippines is Siam, which is a country a little different from the others in this: It is a country which is independent, it has its destiny in its own hands. It has now a king who is a very well educated, modern man who wants to go ahead, is progressive, and is looking forward for his country. The people are hard working, sturdy sort of individuals. They, too, are accustomed to tropical conditions, living simply. Life is very easy for the Siamese and there is not much urge to change their habits of life. They have plenty of land, they lack fuel, they may have petroleum—we don't know about that. The Siamese Government has recently employed an American engineer to make a study of their petroleum fields, and in the meantime all possible petroleum lands have been withdrawn from entry. They export tin and tungsten. So far, these are the only minerals which have been exported in quantity.

The great tin fields of Malaya run up the coast into Siam, and there are possibilities of further development along those lines.

One of the factors to the development of industry in Siam, and the same applies to Burma, is the fact that the people are Buddhists. The Buddhist has always before him the law of impermanence, the thought that everything in the world is transitory anyway and, therefore, he does not build for the future. He sees no reason why he should. Accumulation of wealth doesn't appeal to him as a matter of any importance at all. In fact, you may have some very annoying things happen, such, for example, as the boy who works for you and is in very

hard circumstances, his family is in distress, so at some sacrifice to yourself you make a contribution to his family exchequer, and you find the next day that he has acquired merit by giving away all this wealth to his brother because, after all, it was a purely temporary matter and unimportant anyway. If you get a people who cannot accumulate for the future, where things come easy, where they get enough to eat and enough to wear and get enough sleep, you have a poor basis for building up modern industry, because our whole industry is based more upon inducing people to work by the thought of the future than anything else.

There is a very grave question as to the extent to which industry will develop in either of these lands. You have also particularly in Siam the very sharp division between the nobility and the peasant. There is no middle class. In fact, as you know, there are few countries in the world where there is any middle class except where industry has developed on a large scale. So of Siam and the Malay states that are under British protection, the Malay states are the greater source of tin for the whole world.

I may say that the supply is falling, but there are unexplored areas and there are distinct possibilities for the future, and certainly for some time to come the world will depend upon Malaya for the larger portion of its tin.

The gold mines have been generally disappointing. They have found some gold there, and there are one or two important mines. They have one lignite mine which the government has been working and they produce some lignite. There are some possibilities of petroleum.

This seems to sum up the major possibilities of mineral development in that territory. It is a country where British capital has a very natural advantage. There are not many artificial means adopted to give it an advantage, except in the matter of the protection of the tin smelting in the Straits settlement, which, by the way, is separated from the Federated Malay States. In general, the people outside have some opportunity to get in, but the more natural inherent fact that it is a British colony and that the trade is with Europe, gives the British capital a tremendous advantage in that territory.

It is a country of Chinese labor. The Malays do not work,

and so far as any one knows they will not work. They are land owners and gentlemen of leisure. Their idea of life is to be in Parliament. The British have interfered with that, so now they gamble or go fishing. The Malay is an elegant gentleman to meet but not a very effective worker. They have imported Chinese labor. It is essentially a Chinese country under British control to this day.

Across the Straits from there are the Netherlands, Indies, under control of the Dutch. This is one of the largest sources of tin. They have some very important gold mines of the rich tertiary type. They have others in reserve and a considerable area to be prospected. They have coal mines in Sumatra, and they have some of the same iron ore deposits as in the Philippines. They have also important petroleum fields as you have all learned from recent newspaper accounts if you haven't known it before. The people are industrious, they are numerous, they are pleasant people to work with and to know. The Dutch keep a firm hand on the people and on the industry, much firmer than our govehnment does in the development of industry. They have not only the Geological Survey to study deposits and a Mining Bureau to work out processes, but they actually work the mines. They develop a gold mine with something like $20,000,000 gold in reserve, and then refuse to let you bid on it on a lease; they prefer to mine it on the government's account, so the opportunity for outsiders is limited. Whether they will change their attitude in the end we don't know, but at present that is their mental attitude.

It hardly seems to me likely, though this is a matter of opinion only, that the territory of the Indies will become a large manufacturing territory. I think it is much more likely to become a source of materials for Europe rather than a source for working up the material. One reason is that their coal fields are relatively limited and the coal is only of moderate grade, and such iron ore as they have is laterite which imposes difficulties in development.

Burma I have already referred to in so far as the people are concerned. They are a delightful, charming people indeed, but not worth much in the development of industry. Burma has petroleum fields. They are among the important shippers of tungsten, and they have one of the greatest lead, silver, zinc mines of the world. Personally I never saw a larger deposit of

sulphid ore anywhere in the world. The country is, however, now restricted as to development to British capital. There is an actual legal limitation on the ownership of mining claims or the majority shares in the country by anybody who is a non-British subject. This is one of the cases where as a result of the war the tendency towards nationalistic control and development has been given expression in the form of law.

Across from there is India, which is a very large country with a considerable variety of climate in spite of the fact that our stories all seem to come from the hot country, and a considerable variety also in people. It has also a considerable variety in resources. There is coal and iron, graphite, manganese, gold, and many of the minor minerals. I have mentioned only those which seemed likely to enter into the word's commerce in a large way. They are finding great iron ore ranges there, and they have a considerable area of coal fields. Temporarily they are restricted in coal production because of the difficulty in getting labor in spite of the fact that they are in one of the most densely populated countries on the face of the globe.

In the Far East, as you perhaps know, a man follows the trade of his father and also he belongs to the caste of people, and it is a very serious matter to make a change. In the past, in India they didn't have much mining; therefore, there were not many miners, and there is no caste of miners. It is extremely difficult to get men to man their mines.

It seems likely to me that there will be a very considerable development of manufacture in India. Historically there was a large development of manufacturing in India. There was a time when Indian ships laden with Indian goods were important in the harbor of Liverpool and London, and the blotting out of that trade was largely a matter of tariffs laid by the British authorities with the direct purpose at that time—a selfish purpose—of developing British trade at the expense of India. I am glad to say that that old-fashioned idea has died out and the Indian government is now developing a Department of Industries and making a real attempt to develop industry in India. This was one of the things which grew out of the war. When they came to man the Indian troops and furnish them with munitions, they found it was necessary to do this, and one of the most helpful and hopeful things in the Far East is this

attempt to enable the Indians to become economically independent and self-supporting.

Reviewing, then, in a few words, the Far East is a country which is moderately rather than inordinately rich in minerals. If industry develops out there, the bulk of these mines always will be needed, I think, for local industries; that is, the consumptive power of the people will go up with the development, and the bulk of the material is going to be needed there. There will be, however, an exportable surplus—something which will come out and which can be used as raw materials for other peoples in a number of special lines, such as tin, tungsten and, perhaps, zinc of certain areas. Copper now comes from Japan; antimony from China, and various things of that sort.

You will understand that the adjustment of the rights of various people, the right of opportunity to develop, is one which is very critical; it is one which is important to all of us and is one of the things which will inevitably enter into the discussions at Washington next month. (Applause.)

SECRETARY CALLBREATH: Before you introduce the next speaker, I desire to announce the conclusions of the Board of Directors with reference to the official Board of the American Mining Congress for the ensuing year. I desire to announce that for President, Mr. W. J. Loring has been re-elected. (Applause.)

First Vice-President, Mr. D. V. Wentz

Second Vice-President, Mr. E. L. Doheny

Third Vice-President, T. F. Brewster

The present Secretary has been continued, and the Executive Committee will consist of Sidney J. Jennings and Robert Linton.

May I be permitted at this time, as I am about to present to you the President for the ensuing year, to express my heartfelt appreciation of his cordial sympathy, his active co-operation, his earnest effort at all times during the past year to sustain the efforts of our organization and to all of those things which a President can do in building up and strengthening the organization. It is a very gratifying thing to be able to state that during a year of very great depression, as this has been, and particularly in the mining industry, the American Mining Congress has been able under his wise leadership and assistance to keep up its financial support; we have been able to maintain our organ-

ization intact; we have done many things and incurred a number of outside expenses which have been more or less unusual, and I want to say that without that cordial support this work could not have been accomplished. This was a year of depression. Most every organization which had been in the habit of giving expositions, this year said, "No, it is foolish for us to try in this time of depression to pull off any enterprise which calls for financial support of the business interests." Our leader said, "When the others falter it is time for us to go ahead." His watch-word was "Let's go!" I point with very great satisfaction to this marvelous exposition of mines and mining at the Coliseum as a tribute to that policy of our President who said, "Let's go!"

I take great pleasure in presenting to you Mr. Loring, the President for the ensuing year. (Applause.)

PRESIDENT LORING: Mr. Secretary, Ladies and Gentlemen: It has been a great pleasure for me to work with the American Mining Congress during the past year, and if I have succeeded in doing all of the good things that Mr. Callbreath alleges I have done, I am very pleased and I think the effort has been well repaid today. It shows some confidence in me by being re-elected. All that I can say is to assure you that I will do as much in the future as I have done in the past—that is if I live for the next twelve months, and I don't see any likelihood of anything happening in that line during that time.

I want to say that it would have been quite impossible for me to have accomplished the wonderful things that it is said I have done during the past year without the assistance of Mr. Callbreath and his wonderful staff. They have been ever ready to serve the mining industry of this country, and its members. Those of you who have had occasion to use the Mining Congress I am sure have recognized that what I say is true. I sincerely trust that those of you who do not know the wonderful work done by the Mining Congress at Washington shall make use of it at some time in the future. When you are in trouble, go to the American Mining Congress in Washington and they will cure your trouble.

I thank you very kindly for receiving me as you have done.

Mr. Bain mentioned something about the largest sulphid ore body that he had ever seen in Burma. I want to say that I was the man that started the first development work on that sulphid

ore body in those mines. That was in 1909. I am very glad to be able to tell you that. (Applause.)

Mr. H. P. Wright of Kentucky took the Chair.

CHAIRMAN WRIGHT: The next address on the program this afternoon is "Methods Used in Europe in the Control of Coal Mines and the Distribution of Their Products" by George S. Rice, Chief Engineer of the Bureau of Mines. (Applause.)

MR. GEORGE S. RICE: Mr. Chairman, and Gentlemen of the Convention: Stabilization of coal industry is a world-wide problem. Fuel, which today means coal, is vital to our modern civilization, and such substitutes for coal which we now know—petroleum and water power—are inadequate to supply the power and heat required. Every great nation to obtain and hold its present rank has given and must continue to give first consideration to securing a supply of fuel at moderate cost by developing its natural resources, or by importation from a neighboring country more favored by nature.

The United States, Great Britain and Germany became industrially great and nationally powerful through having abundant coal resources and intensively developing them during the last 50 years. Other countries with lesser coal resources, or who have not developed them, have lagged behind industrially in the race for supremacy, except as in the case of France where its neighbors have made up its requirement of fuel at moderate cost.

Although the United States has by far the greatest coal resources—50 per cent of the world's known supply—its coal industry has been most unstable for many years, undoubtedly due to this very abundance and the ease of developing it. Hence it is desirable to review the conditions prevailing in the industry in the older coal mining countries of Europe to see what suggestions may be brought to light in solving our present acute situation in the coal industry.

Necessarily the subject must be handled briefly in a paper of this kind, and consideration will be confined to the industry

---

The data used in preparing this paper was obtained in trips of investigation made by Mr. Rice in European mines in 1908, 1911 and 1919—also from Report Coal Mine Labor in Europe by Carroll D. Wright, Commission of Labor (1905), and Combinations in the German Coal Industry by Francis Walker (1903).

in three countries, with the largest production in Europe, and which represent three differing methods of control and conditions; viz.: Great Britain, Germany and France; Great Britain with large coal resources and having an extensive ocean borne export coal business; Germany with still larger resources, also exporting extensively, but largely by railroad and canal; and France, with relatively small resources, and obliged to import before the war one-third of the coal it consumed.

The coal resources of Great Britain, including "probable reserves" are estimated at 190 billion tons. This is practically all high grade bituminous coal, with a limited amount of anthracite. It is well distributed, South Wales, Yorkshire, Durham, Lancashire and Scotland having the largest resources. Great Britain's highest production, 287 million long tons, or 322 million short tons, was obtained in 1913. Practically all the shallow and easily won coal has been mined out, and coal must be raised from depths of from 1200 to 3500 feet. While there are local thick coal beds, the majority are thin, pitching and faulted and generally gaseous; and, due to the great depth the roof is friable and requires systematic timbering. The yield per man per shift, formerly 1.1 tons, has been dropping, and now is but eight-tenths ton per shift, and therefore the cost of production is high. Prior to the war the mine cost of coal on cars varied from $1.50 to $2.50 per long ton. The operators profit on the coal was from 10c to 75c per ton, and was considered to average about 25c. The average selling prices including all sizes at the pit mouth in 1913 were in Wales, $2.86; in England, $2.40; and in Scotland, $2.36 per long ton. The miners then earned from $2.00 to $2.25 per shift of 8 hours from bank to bank. Since the war the miners' wages and the costs generally have doubled and are unstable at the present time.

The coal resources including "probable reserves" of the old German Empire were estimated to be 423 billion tons (metric tons, 2204 lbs.). This includes 16.6 billion tons in the Saar, the ownership of which has been transferred to France as result of the war, and 166 billion tons in Upper Silesia, the ownership of which is still unallotted, but if entirely lost to Germany it would still leave resources to Germany of 241 billion tons, which is in excess of the resources of Great Britain. By far the largest resources and the best coal is in the Ruhr district which has the

largest resources in coking coal in Europe. Of the total resources, 13 billion tons are brown coal found in the North German States. Brown coal deposits lie near the surface and have been developed to a production out of proportion to the resources.

The shallow lying bituminous coal of Germany like that of Great Britain has been long ago mined out and the bulk of the coal now comes from 1500 to over 3000 feet. The coal beds in the Ruhr basin are usually pitching, are thin, and have a roof which requires systematic timbering. The mines are also gaseous. In some places the shafts have been very difficult to sink on account of water bearing ground encountered in the overlying strata, this water-bearing ground sometimes reaching a depth of 600 or 800 feet.

The production underground per man per shift prior to the war was only 0.8 tons. In 1913 in the Ruhr the cost of mining and loading on cars was about $2.00 per ton metric; the lowest mine cost in a group of mines was 1.61, the highest 2.26. The net profits of mining operations ranged from 25c to 50c per ton. The miners underground earned from $1.50 to $1.75 per shift of nine hours from bank to bank, or eight hours in their working place. The average value of the coal on cars at the mine in 1913 was reported to be $2.61.

In Upper Silesia some of the coal beds are very thick, often pitch steeply, but in general are flatter and the roof better than in the Ruhr. The mines have extensively used the sand filling methods as a means of preventing spontaneous fires, explosions, and prevention of subsidence. The yield per man per day is higher than in the Ruhr district, being about 1.1 tons metric, per shift. The coal is not of quite such good quality as that of the Ruhr and there is a more limited quantity of coking coal.

In the Saar there are numerous beds, and locally some are thick, but they are steeply pitching and faulted and the roof is friable requiring systematic timbering. Twelve million tons out of the 17 million annually produced in the entire Saar field before the war was mined by the fiscal or Prussian State owned mines. The arrangements of these mines appeared to the writer to be unnecessarily complicated and the labor yield low. There were but .75 tons produced per man per shift. The earnings were generally slightly higher than in the Ruhr and Silesian

field. The production in the Saar under efficient management can probably be materially increased. Government operation in the Saar does not impress the American visitor as efficient. There is too much complication and elaborateness of plants for the tonnage produced.

The German Empire production of coal in 1913 was 278 million tons metric, or 306 million short tons. 191 million tons bituminous coal, and 87 million tons lignite or brown coal. This includes 43 million tons from Upper Silesia, practically all bituminous, and 17 million tons from the Saar, also bituminous. On the basis of 1913 production, should Germany lose control of all of the Upper Silesian field as well as the Saar, the bituminous output would be reduced 60 million tons, or on the basis of 1913 its annual production would be but 131 million tons, so most of it would come from the Ruhr field, the output of which in 1913 was 114 million tons. This production dropped to 71 million tons in 1919, but is now recovering.

Germany made 32 million tons of coke in 1913, of which 25 million tons was made in the Ruhr, 3 million tons in the Upper Silesian field, and 4 million tons in the Saar. The German Empire exported in 1913, 44 million tons of fuel of different kinds, and imported 18 million tons, of which imports 9 million tons were derived from Great Britain, and 7 million tons of lignite from the Austrian Empire in exchange for 13 million tons of bituminous coal, including 1 million tons of coke. Most of this export coal was shipped by rail or canal—only a small part was ocean borne.

The coal resources, including probable reserves in France, were estimated at 17 billion tons, practically all bituminous coal, most of which, chiefly in the Valenciennes Basin, is of good grade. As the result of the War the coal resources of the Saar, amounting to 16.6 billion tons, have been transferred to France, thus practically doubling its coal resources. The coal beds of France vary widely in thickness. There are some beds locally thick in the small basins in Central and Southern France, but the bulk of the resources are in thin beds in the Pas-de-Calais Nord field, where the average thickness of bed worked is about 3 feet. The beds are steeply pitching, folded, and in the north of France much contorted and gaseous, probably more difficult conditions than are found in other fields of

Europe except in Belgium. The shallow portions of the beds have been largely worked out so that the coal must be hoisted from depths of from 2000 to nearly 4000 feet. In the northern field the coal is over-lain with water-bearing sands and marls, which have required the extensive use of the freezing process, and more latterly, of the cementation process for shaft sinking.

The production of France in 1913 was 41 million tons metric of bituminous coal. It required the importation of 21 million tons of fuel for consumption, of which 11 million tons came from Great Britain and 3.5 million tons of coal and 2.4 million tons of coke from Germany; nearly all the balance of the coal imported being from Belgium which furnished 3.6 million tons.

The Germans wrecked, during the war, mines which produced 20 million tons of coal, which cut in two the production of France, and it was estimated it would take 10 years, or until 1929, to recover the devastated mines and bring up to the former production, disregarding the natural increment in production in that period had the mines not been wrecked. The mining plants destroyed, including model miners' villages, were among the finest in the world and also caused loss to France of the larger part of the coke production with its by-products. It was this destruction, 80 per cent of which was willful and unnecessary, that caused the treaty makers to transfer the Saar coal mines with their annual production in 1913 of 15 or 17 million tons including Lorraine mines to French ownership.

The production per man per shift in French mines prior to the War was about one ton (metric). The cost of mining varied from $1.60 to $2.80 per metric ton. Under normal conditions the selling prices at the mines ranged from $2.75 to $3.50 per ton giving profits of from 50c to $1.00 per ton. The earnings of the underground miner prior to the war ranged from $1.25 to $1.75 per shift of 8 hours. Conditions in the Saar now transferred to French ownership have been previously described.

In Great Britain the coal ownership was vested in the owner of the surface. In many instances the ownership of coal bearing lands has been in extensive entailed estates. Some of the largest of such estates are the property of the aristocracy, dukes and lords who traced their rights to mediaeval days or to grants of the crown several centuries ago.

Some of the mine owners have purchased the surface and

coal in fee, but it is generally leased. The royalties range from 6d to a shilling, or (on a basis of normal exchange) from 12c to 25c per ton. Except for the period during the war, the Government exercises no control over the business of producing and selling and distributing coal, confining itself to the police regulations for safety which are much more stringent than in this country and tend to bar out the introduction of some labor saving devices employed in this country, such as trolley locomotives, on the ground of danger. Personal injury compensation of miners is required by law. So far as is known to the writer, there are no legal restrictions to selling combinations and pools. But during the war the government compelled a general pooling of interests with the guarantee of net earnings of 1s 3d (30 cents). Following the great strike of miners in the spring, in their effort to compel nationalization of the industry, a compromise has been made by which the miner shares in the profits after a limited allowance has been made to the owner. The plan also includes a sliding scale based on output to encourage increased production.

In Germany coal in the ground is not subject to the disposition of the owner of the surface, but it can be prospected for and exploited only by permission of the State. This also applies to the owner of the soil. Others, by permission of the state authorities may explore and develop, and if the owner does not give his consent the State mine authorities intervene and may grant the right, with no bounds as to depth. Damages done to the surface by mining operations and rentals for the ground used may be determined by mining authorities and paid by the mine to the proprietor of the soil.

The government has severe police regulations governing the safety of the mines and apparatus involving hazards cannot be introduced except by specific authority.

Germany requires personal injury insurance for employers and also invalidity and old age insurance. In the latter the employer pays half and the miner half of the premiums.

States such as Prussia and Bavaria also own and operate certain mines.

The most important of these Government operations are those of Prussia in the Saar district where three-fourths of the coal was produced by the State. These mines are now transferred

to France by the Treaty of Peace. The Prussian government also owned an important group in Upper Silesia.

The German government permitted and in fact encouraged the consolidation of mines and the operation of pool selling cartels and syndicates.

In France the owner of the soil has no right to the underlying mineral. He is entitled, as in Germany, to compensation for damages but cannot prevent the exploration and development of the minerals. The State makes concessions in such size and form as to permit the best development of the mineral. By permission of the government, concessions may be consolidated. The coal mining companies usually purchase as much of the overlying surface as necessary for the intensive mining which occurs in the limited coal basins.

The Government requires a small annual rental per unit of area of the concession, but its chief revenue from the mineral is obtained in lieu of taxes by taking a percentage of the net earnings (in 1912, 6%) thus virtually making the government a partner in the mining operations.

The government makes stringent police regulations for safety and requires the conservation of the coal by proper mining methods, which involve the filling of excavations by broken rock, or debris, or by sand hydraulically placed.

France permits the operators to combine and support a national association in which practically all owners are members and the mine owners are taxed pro rata for the support of a bureau called the Central Committee (Comité Central des Houilleries de France) with headquarters at Paris, which keeps statistical records, encourages betterments, and supports a testing station for safety devices and apparatus. This testing work is carried on similarly to that of the Bureau of Mines at its Pittsburgh Station and under Colonel Taffanel did splendid original work in coal dust explosibility testing. The government cooperates through furnishing engineering personnel for the conduct of the work as in the case of Colonel Taffanel.

The Central Comité is claimed to have no marketing or selling organization and the government does not control marketing. Theoretically at least, cartels or syndicates after the German plan for control of prices, do not exist, but apparently there is no objection to an understanding regarding prices among the

mine owners in the different districts. The government has access to all reports and figures to verify the revenue due at some of the mining operations.

The French mine owners are in the fortunate position of being practically assured of a fair profit if their concession contains mineable coal. Import coal is taxed in normal times. There is never overproduction so the miners work every day except holidays; hoisting coal on both night and day shifts, as is also the plan in Great Britain and Germany, thus utilizing expensive mining installations, which in the United States lay idle for two-thirds of the 24 hours,—thus increasing the investment charges on each ton of coal produced.

In Great Britain individualistic methods have been followed, except for the period of the war, in the fixing of prices and in the marketing of coal. The great variety of coals produced in that country increased by careful subdivision of sizes, similar to the practice in this country in anthracite sizing, has led to a great diversity of prices, and each mine owner or company was, prior to the war, its own judge of the price to be fixed. Although as there were loose associations of owners in the different countries or districts such as South Wales or South Yorkshire or Durham, which undoubtedly have discussed fixed minimum prices, coal is sold either direct to consumers or through middlemen. The wide distribution of coal and short hauls have made the cost of coal to local points relatively low.

There have been periods of great prosperity and again of great depression, but probably at no time prior to the World War was the depression so acute as often obtains in the bituminous industry in the United States. In general it was not understandable by the British owner who does not consider selling coal at or below cost as too often occurs in this country in the summer time. England is fortunate in not having such great extremes in weather conditions as between summer and winter, as prevail in this country, and the mines have in the past worked with great regularity, usually working from 275 to 300 days in the year.

The saving situation in Great Britain has been in the large market for export coal and the good stocking quality of most of the soft coal. Further, they have adopted the plan of briquetting the fine coal, especially South Wales coal of "admiralty" grade.

In 1913, 77 million long tons of coal, or 85 million short tons, were exported. The exports therefore represented one-fourth of the entire production. The nearness of the export coal to the shipping ports was a big factor in the control by Great Britain of the ocean-borne coal trade of the world. In South Wales the coals for export have to be carried less than 20 miles to docks, and in general the cost of transporting and loading on vessels was less than 50 cents per ton. The average value of the coal loaded for export—chiefly the higher grade coal in 1913—was $3.40 per long ton at the mines.

Coal has been sent to all parts of the world through the development of the great ocean carrying trade of Great Britain, and has been one of the most important elements in its commercial prosperity, through giving vessels, cargoes both ways, exporting coal, and bringing in other raw material, such as food products, cotton, hides, nitrate, etc.

This export business has been admirably worked up, through the establishment of docking facilities for unloading, bunking ships, storing and distributing coal in various ports throughout the world, hand in hand with banking arrangements to facilitate business.

The government at one time proposed an export tax on coal, but this was bitterly contested and defeated. In the past, mining companies have been prosperous, but conditions resulting from the war, and the severe labor troubles following, in attempts to nationalize the industry and maintain wages of miners above those paid by other industries, have brought difficulties to the mine owner. Decreased yield per man per shift and generally increased costs have made it harder to meet foreign competition.

Nationally speaking, the lessened production is most serious and is giving the greatest concern to publicists. At the present time Great Britain is able to supply but 25 million tons for export, or only one-third of what it exported in 1913. In the great strike which occurred during the past year when pumpmen were compelled to stop by the miners' union, some of the mines were flooded and so seriously damaged that it did not pay to reopen some of the older mines.

As the more easily developed coal of Great Britain has already been worked out, it is with increasing difficulty that the production will be maintained through new developments in deep lying beds.

Germany is the one country in the world where Government ownership and operation has existed side by side with private development. The policy of the German Government has been to foster cartels and syndicates. The most important of these syndicates is the well known Westphalian Coal Syndicate, which was established in its present form in 1895,* the mines of which prior to the war produced from 85 to 90 per cent of the gross production of the Ruhr in 1913, 114 million tons. The second most important coal syndicate was that of Upper Silesia, which was formed about 1891, but was secretive in its plans until a later period. It is interesting to note that the Prussian fiscal group of mines was a member of the syndicate. In the Saar as the Prussian Government operated most of the mines no syndicate was required. The brown coal operations had in the several states their own syndicates or cartels, and there were many others in various German industries.

Prior to the formation of the syndicates the coal industry of Germany had the same kind of difficulties as have prevailed in that industry in the United States. There were periods of prosperity and longer periods of depression, not always so attendant upon the volume of business, but perhaps more largely through general business depression. The German production is not so much affected by seasonal changes. Bituminous coal stocks well, and slack or fines are largely washed and briquetted and it is the custom to stock coal near the point of use. Brown coal is very extensively briquetted after drying, the briquetting being done without binder, and when in that form will stock well.

During the periods of business depression there were frequently no profits, and even losses experienced several years at a time. In the period between 1877 and 1893, cartels or agreements about minimums prices were made, but always failed. Finally, after numerous preliminary failures, the great Westphalian Coal Syndicate was established in 1895, and at least up to the end of the war was very successful. It is a combination to market the coal of its members. It fixes the amount of coal which each member may produce from month to month, prorated on the theoretical capacity which is determined from time to time. The restriction has varied from 5 to nearly 20 per cent of the theoretical capacity which is redetermined from time to time.

*The cartel was renewed in 1905 and again in 1915.

There is an intricate system of penalties and premiums in the production and selling of individual members. All the coal produced must be marketed through this syndicate, and at prices fixed by it.

The funds for carrying on the syndicate, the capital of which is comparatively small,* and only enough for carrying on current business, are raised by assessing the members in proportion to their production. The syndicate endeavors to reach new markets, and especially prior to the war encouraged the export of coal at prices less than paid in the home markets, in order to compete with Great Britain, and develop foreign markets, especially in Italy, Baltic States, and South America. There was much complaint at home against selling at prices less than the Germans themselves had to pay. The government encouraged the export business by making especially favorable rates on the government owned railroads. The German coal, like export coal of the United States, possesses a disadvantage for ocean-borne business in comparison with Great Britain in having a long haul to the seaports, though not so long as that of the United States. It is 118 miles from Dortmund to Bremen and 168 miles to Hamburg. Upper Silesian coal would have a much longer haul and it cannot compete for ocean business with the Ruhr coal. (Germany undoubtedly coveted Belgian coal for export business, as it is comparatively near tidewater.)

The city of Essen furnished an office building for the syndicate, thus indicating the community of interest. Besides the marketing of coal the syndicate, by co-operation with the Dortmund Verein, and other agencies, carried on investigations into betterments in mining methods. The Verein issues weekly Glückauf, a well known technical journal on coal mining.

For the local markets the syndicate fixed prices annually in advance, and these prices were published and theoretically adhered to. However, complaints arose that the large consumers were favored by rebates, and that there were agreements between the syndicate and certain middle men. The prices charged by the middle men and the retailers for distributing coal were in general higher than those in the United States, so that a small user might pay double the price listed by the syndicate,

---

*2,400,000 M., $600,000 in 1910, 1 share of 300 M. par value for 10,000 tons annual production. In 1913 the syndicate mines produced 101,650,000 tons.

and moreover, have to accept the kind of coal which it chose to send. This situation was combatted by the formation of associations of consumers, one group reported to have 500,000 members, and to sóme extent this plan was successful in preventing alleged bad effects of monopoly. Moreover, the syndicate tried to follow a moderate program. On the whole the system of syndicates was highly thought of in Germany by business men, and generally approved as having a steadying and beneficial influence; and while to labor it presented a combination difficult to secure a hearing from, on the other hand its policy appeared to be to improve the living conditions of the miners, and from time to time give such advances in pay as seemed proper under the industrial situation at the time.

The Upper Silesian syndicate with headquarters at Kattowitz, was a somewhat looser organization, one which fixed minimum prices of coal going to certain markets, but did not act as a selling agency, the selling being done directly by each individual company. The Upper Silesia syndicate also supported investigations for increased safety in mines, including an explosion testing gallery, and a mine rescue testing and training organization headquartered at Beuthen. This syndicate functioned well, at least prior to the war, but the writer does not know the effect upon the syndicate, of the present political question regarding ownership by Germany or Poland, to be decided shortly by the League of Nations.

Through the control by the syndicates the mine operators were able to maintain a profitable business from year to year, and while there was from time to time some curtailment of production, they were apparently always able to get a profit on the coal produced by preventing the slashing of prices which occurs with overproduction.

The conditions in France have already been to a large extent indicated. The markets are at home, except for a limited supply of coal furnished to Italy and to Switzerland from the southern coal fields of France. The mine operators are in a fortunate position in that they are always able to have a market for all the coal they can produce, hence the mines run every working day in the year. France protects its coal operations by making a tax upon coal imports. The coal prices in France are apparently fixed in advance from time to time by an understanding among

the operators of the district, and the mines as a whole have always shown a profit. Any depression immediately affects the import of coal but does not more than temporarily affect the local production.

We have presented here three types of control of mining and marketing of coal. England has the individualistic method, with unlimited competition, as in the United States and with the same tendency to unstable markets, is saved from periods of acute depression from overproduction only by the ability to dispose of its surplus coal by export. The slow and expensive development of new mines, necessitated by the deep lying coal, is also a brake on overproduction. Germany has some government owned mines and the ability to restrict unnecessary development of new mining areas by withholding the granting of concessions, and with selling syndicates operating with full concurrence of the government encouraging export and restricting production to prevent a surplus in the coal market, at the same time encouraging betterments in mining methods; and France has no surplus production but on the other hand need of importing, and, by virtue of partnership with the government, the mine owners always are assured of making profit although ostensibly without combination to fix prices.

It appears to the writer that from England we can borrow the idea of developing of exports as a means of disposing of the surplus, the briquetting of fine coal, and the stocking of coal at distant ports throughout the world.

Regarding German methods, whether we can utilize any ideas from their plan of syndicates is a question. Our whole national tendency is to oppose combinations held to be "in restraint of trade" but it is possible that we could employ the idea of restraining the overdevelopment of coal mines with its accompanying tendency to wastage and irregular work for miners (which in turn reacts on the cost of coal to consumers) by not giving shipping facilities to proposed new mines unless it was shown to some authoritative body, such as the Interstate Commerce Commission, that new developments were needed. In any case we can learn from Germany the utilization of coal by-products, the briquetting of lignite as well as bituminous fines, and betterments in mining methods such as hydraulic sand filling to prevent subsidence and mine fires, and the use of substitutes for timbering.

From France we may learn that it is possible to have an amiable understanding or partnership with the government without loss of initiative in mining developments. We may also learn thoroughness in extraction of coal in thin as well as thick beds and, where there is a large coal area tributary to a mine, whether it may be made a more permanent local industry rather than in the usual way to extract hastily the thickest or best coal; also, to put in more permanent and even artistic plants which will continue to be the source of support to the community, over a long period even though this plan may not bring the largest or an immediate return on capital through the quick extraction of the easily mined coal.

From all three countries as well as from Belgium we can at least learn much in the careful preparation of the coal for the market, the stabilization of the quality of the coal and in matters of briquetting and stocking, and especially from France and Germany give consideration to that part of the purpose of mine operators' organizations which have done so much in those countries for miners' welfare, protection of life, and investigations for improvements in mining methods.

The writer also ventures to suggest that while the project is an admirable one of encouraging the stocking of coal in the United States, which has been so much discussed since the war as a means of preventing stoppage of bituminous mines in the summer and consequent need of paying the miners higher wages than in other industries to provide adequate living, the cost of which must ultimately be borne by the consumer, it is a project that will fail to accomplish its full purpose—permanent stabilization—unless some measures are taken, as in Germany, to prevent the over-development of bituminous mines which have already reached double the capacity now required by the country.

SECRETARY CALLBREATH: I want to deliver to you an invitation on the part of Mr. G. M. Howland and Dr. Bain of the Bureau of Mines to visit a demonstration at the experimental mine of the Bureau near Pittsburgh, on Saturday, October 22. I have no doubt it will be a very interesting demonstration and experiment.

CHAIRMAN WRIGHT: The next address is to be on "Protecting American Industry," by William J. Hale, Dow Chemical Company, Detroit, Mich.

MR. WILLIAM J. HALE: Mr. Chairman and Gentlemen: I come here from the chemical foundation as a sort of chemical educator, and our idea is that this country needs education. We think we know something about the various sciences, but we have yet a lot to learn.

The World War opened our eyes and we beheld organic chemistry the crown ruler of the universe. Germany failed by reason of her short-sightedness in chemical warfare and her inability to sense the keen and versatile minds of a more daring adversary. At the peace conference there was conceived that deformed imbecile—the Bungle of Versailles. Learned men were gathered from all quarters of the globe, but it never occurred to any that this pre-eminently chemical war need require the consideration of chemists. The Bungle turned out to be a monstrosity—not even the advice of learned men, other than chemists, had much sway. Germany was reprimanded, her claws clipped, her hands bound, and her playthings, or the battleships, those scarecrows for smaller nations, sunk. She was lovingly allowed to keep all the implements for future war—airships and chemical plants.

The dye plants are the chemical arsenals for future conflicts. Dyes are made by processes easily transformable into poison gas manufacture. Germany is operating today one particular dye plant that may be transformed into a mustard gas plant in fifty minutes. She will never again be caught napping. Nor is there any power on earth today that can defeat her. With her chemical arsenals in best of condition all the world cannot defeat her. She was left to become the supreme dictator of the world at a moment's turn of the wheel, and for this we need bestow our praise on the Bungle of Versailles.

We must develop the dye industry in America with greatest speed. Today we are manufacturing about 100 dyes perfect in type and the equal or better of their counterparts imported from Germany before the war. There are many dyes which are not yet made by us true to type, and there are still more of the one thousand or more of pre-war German dyes not yet attempted. Given time and protection, we shall make sure and steady progress and shall soon surpass the best that Germany ever made. The manufacture of dyes calls for the highest mechanical skill and plant supervision in the field of organic chemistry. The

various steps in these processes make up a complex surpassing that of any other industry. The money outlay for placing one of the more complex dyes on the market is simply stupendous. Thus the first pound of indigo made in this country and placed on the desk of the president of the Dow Chemical Company cost this company $445,000.00.

All the civilized countries (save only ourselves) have realized the importance of organic chemical plants as a safeguard to civilization. We are not yet awake in this country to the fearful consequences that will surely befall us if we surrender now to foreign influence. The German importer, pretended American, but false to the heart, sees that this is the great and final stand for Germany. If he can secure the German products, now so cheap, he can wreck the organic chemistry industry of this country and little by little all of the other industries. He need but defeat the tariff bill and our country becomes German.

Above all, we must have the Fordney Tariff Bill enacted into a law at the earliest possible moment. Many men need employment, and they find it not. Nor will they find it until the tariff is settled. Money will not seek investment until there is abundant assurance of settled industrial conditions. Listen to the prattle about the Panama tolls and anti-beer. What do these childish things amount to in comparison with the needs of our industries? 'Tis the industries that must open up means of employment. The tariff, and that alone, is the crux to the whole situation, and a sure guide to prosperity. Mr. Fordney has embodied in the new tariff measure the greatest and most scientic principle ever proposed in the history of American tariff—the fixing of duties based upon American valuation. At last a tangible base is set before us and the foreign falsification of values forever eliminated. What manner of mortal man ever heard of even an approximate value to an object purchased in foreign lands? Mr. Fordney brushes aside the dust of countless years of forgery as practiced by importers—the un-American agents of Hades, and opens the books of American manufacturers where costs of production are easily discernible.

The tariff, gentlemen, is the most important question before Congress. Pray think seriously upon it, and upon the opportunity that knocks at our door, now or never, to build up the great dye industry, an industry that will enable us ever to be

ready in case of war to combat fiercely and courageously, and with abundant ammunition—for remember, the next war will be chemical—a chemical warfare that will require the constant labor of every scientist in America.

The German importers have no regard for America. They labor for themselves alone, greed and profit are their idols, "To hell with America," is their slogan. Witness, for example, those words shouted on the floor of the House of Representatives in Washington, by that arch-criminal, H. A. Metz, when he was finally able to defeat the passage of the Dye Embargo Clause in the Fordney Tariff Bill. This man is universally hated by all chemists in America; though born in America, he is a curse to the country. And so with other German-Americans, they are working night and day in their efforts to defeat the American Valuation Plan. Today they are stirring up retail merchants' associations, trying to show them that this plan means a higher basis on which to pay duties, and thus a higher price must be asked for the articles sold. Of course, this is so, and it is what we pray for. We cannot compete in manufactures with articles made in Germany at the wages of 17½ cents per day, when we must pay 30 cents an hour. It was Mr. Fordney's foresight that brought this American Valuation Plan to the fore and showed it to be the only hope for American industry.

If the German importers and their diabolical friends can only keep up their steady influence in Congress and hold off the tariff legislation for yet a few months, you will witness the beginning of the downfall of America. The country is doomed and no power but you can save it. We must not be made the dumping pot of foreign markets. The cries of Germans, that they must have a place to sell their goods, is mere poppy-cock. They can sell anywhere they like, but since they cannot sell ad libitum in England, France and Italy, why in Heaven's name do we need be made the goat?

There are many good Americans who positively refuse to buy anything that comes from Germany. I hope you each and all will join our number. We realize that the retail merchant stands ready to make his 300 per cent profit on almost any German article sold. Why should we countenance war profits now, when all are trying to get back to a peace basis? The German

importers are the devil's chosen agents among us. They have no friends, nor do they care for anything but money. Their dream is the dream of the old war-time German. "Let us undersell American products by American industries and we shall be able to drive those industries out of business and eventually control the markets of America, whereby the raw products for the German plants will be brought to Germany from America and returned as finished goods." Thus America will be the vassal of Germany, the dream of every German.

The war today is a war to the finish, and we must not give these German importers one moment's peace. Every move they make we shall counter, and here's hoping that our Congressmen and all in power may soon realize the importance of maintaining American industry for America and the utter banishment of German importers to their beloved Fatherland.

CHAIRMAN WRIGHT: The next address is "The New and Extended Use of Zinc Products," by Mr. Eugene H. Wolff, President of the American Zinc Institute.

MR. EUGENE H. WOLFF: Mr. Chairman and Gentlemen: I heard Dr. Hale make an address a few weeks ago in which he predicted (he would have done it here if you had given him time) that the next war would be from the air alone.

I am here representing the zinc industry of the United States, and I want to tell you gentlemen that the zinc industry was of prime importance and that without it the Allies would not have won the last war. Therefore, why should we leave it or let it pass into innocuous desuetude because the next war will be from the air?

Mr. Chairman, your Mining Congress has on its membership roster many miners of zinc ore, and I believe this is the first time during a period of ten years at least that a zinc man has had an opportunity to address a convention of the Mining Congress. I haven't heard of one in ten years, and we are very glad to have had the opportunity.

Very few people realize the extent to which zinc is being used today in commercial work, in industry. As an example, I can safely say without fear of contradiction that there is not a man or woman in Chicago today whose wearing apparel is not partially constructed of zinc—pure zinc without an alloy. That is the development which has come in the last twenty years.

While it is a development, there is not a great tonnage used in that line of work. We as an organization are trying to develop new uses for zinc.

The history of the production of zinc in the United States is divided into two periods, one of experimentation and inconsiderable production, prior to 1860, and one of commercial production, from 1860 to the present time.

In 1918 the industry had grown to the point where about thirty-five companies were producing slab zinc at the rate of 525,000 tons a year. The war rush of 1917 had carried this production to nearly 700,000 tons. In 1918 there were also three companies rolling wide sheets and a half a dozen companies rolling strip or ribbon zinc. Ribbon zinc is a recent development in this country, our commercial production dating only from 1911.

Prior to 1918 there was little co-operation among the miners of zinc and none among the smelters or the rollers of zinc; in fact, co-operation among the different branches of the zinc industry was not believed to be among the premillenial possibilities. It may be said that, from a craft association viewpoint, the zinc men of the United States were then practically devoid of the "co-operative instinct."

Early tied into the War Industries Board by the creation of a Zinc Producers' Committee, the advantages of industry co-operation quickly became apparent. This led to the formation of the American Zinc Institute. Today probably no other craft association in this country is more representative of an industry as a whole than is the American Zinc Institute.

A survey of opportunities for the increased use of zinc in 1918 led to the conclusion that the greatest expansion for the zinc industry lay in the development of zinc roofing in this country.

Through the American Zinc Institute's advocacy of zinc for roofing purposes, zinc has been more talked about and more advertised in the past three years in the United States than in all of the preceding years.

Sheet zinc has its peculiarities, as has every other metal. Its advantages, however, make the meeting of these peculiarities well worth while. All the sheet metal worker has to do in work-

ing zinc is to do as he does in working any other metal—follow a few simple instructions.

Let us look at some of the advantages of zinc.

It is impossible to imagine a material more perfectly adapted to its purpose than is zinc for roofs and for roofing accessories.

In its natural oxidized state it forms a roof that is a beautiful soft gray in color. The first oxidation protects the metal, and countless years of exposure will have no further effect upon it.

The oxidized zinc requires no paint, although it can be painted any color that you wish. It requires no repairs, and cannot deteriorate in any way.

It is, in fact, possible to build as beautiful a roof of zinc as from any other roofing material.

Zinc is a non-ferrous metal—it cannot rust.

A square of zinc roof, moreover, is lighter than a square of any other durable roofing material. As compared with slate, for instance, it weighs about one-seventh as much and requires a much lighter framing, while forming a better protection against driving rains and snows.

Zinc cannot crack like tile and slate, nor warp, curl, rot or burn like wood and substitute materials.

Zinc, moreover, forms an excellent protection against fire and lightning. It eliminates all danger from cinders, fireworks and flying sparks, and a lower rate of insurance should be secured on all buildings where zinc roofs are used.

The factor of ultimate economy is greater in zinc than in any other roofing material.

These are some of the reasons why sheet zinc has been used on roofs in Europe for more than 100 years.

There is no reason why our American cities, like so many of the cities abroad, should not be practically zinc roofed, zinc guttered and zinc leadered. Thousands of examples exist today of European zinc roofs which were laid 50, 75 or 100 years ago and which are today as good as new. Practically 90 per cent of the European production of sheet zinc goes into building construction, principally roofing.

Why, I ask, should not Americans build their roofs as permanently as the rest of their structures? High labor and high material costs are already promoting a more substantial form of building construction in this country. This is bringing to

the front the question of ultimate economy in all forms of construction, and, as I have already said, the factor of ultimate economy is greater in zinc than in any other roofing material.

Sheet metal workers are beginning seriously to take up the use of zinc, and the Institute is bending every effort to instruct them in its use.

Many new uses have been found for zinc besides building construction, such as in the automobile industry and in the making of washing machines, etc., etc. While these are fields of consumption under constant cultivation, yet very little of the annual production of 50,000 tons of sheet zinc has so far gone into roofing. Is it, therefore, not difficult to vision an annual domestic consumption of 100,000 tons of sheet zinc for roofing purposes alone in the next year or two.

Corrugated zinc is also beginning to play an important part in the construction of farm and factory buildings, at a cost of only about 50 per cent above galvanized corrugated sheets. The United States Government is now requiring the use of corrugated zinc upon some of its buildings, and it is also specifying sheet zinc in the construction of flumes in the Western States.

Today there are available for purchase by the trade batten sheet zinc and corrugated and V-crimp sheet zinc in standard sizes; also zinc shingles, zinc gutters, downspouts, tile, formed ridge caps, valleys, flashings, etc.

I predict that as soon as building conditions become normal, zinc for building purposes will rapidly come to the front.

This should mean prosperity to the miner of zinc, to the smelter of zinc and to the roller of zinc and also to the hundreds of thousands who are directly or indirectly interested in the advancement of the zinc industry in this country.

SECRETARY CALLBREATH: May I present a resolution?

Secretary Callbreath read Resolution No. 13.

The meeting adjourned at 5 p. m.

ANNUAL BANQUET

THURSDAY EVENING, OCTOBER 21, 1921

Toastmaster, Mr. Finley P. Mount

TOASTMASTER MOUNT: Ladies and Gentlemen: Ever since I first learned of the marked distinction conferred upon me to be privileged to preside over this splendid gathering, I have been making an earnest endeavor to get in on the know—the reason why. I interviewed your President, I talked to your Secretary. Mr. Callbreath suggested that he thought they could get me, a rank outsider, perhaps, to indulge in some stories. I told him it was my understanding that since the Eighteenth Amendment a toastmaster's story was altogether taboo. He suggested, however, that we might give them the sonata story. I asked him what that was. He told me I would find out when I came up here to the dinner tonight. He described it about like this: (Of course, you know in telling a story there is always the fear you are going to run against the proposition that the story teller did in Chicago the other day when he told a story and one rather elderly lady laughed uproariously about it and he was pleased and smiled and waited for her compliments and she finally said, "You will have to excuse me, that story has always amused me; in fact, the first time I heard it I kicked the footboard out of my cradle." (Laughter.) So I have a little fear about starting anything of that kind, but on the strength of the Secretary's statement to me I might tell you the sonata story, particularly in view of the liquid lie which we had here tonight. It seems a gentleman was invited out to dinner and while dinner was waiting to be served (of course, it wasn't my friend on the right nor my friend on the left nor either of the secondary gentlemen) it seems they had some music and after the music was finished one of the ladies leaned over to this gentleman and said, "Would you like to have a sonata before dinner?" He woke up and said, "Well, I had a couple on the way down here but I wouldn't mind if I do." (Laughter.)

That is as far as I am going, I serve you notice now. With steel on the right of me and chemistry on the left of me, I certainly can't go wrong.

I understand the American Chemical Society was organized

forty-five years ago. Thirty-eight years before the organization of that Society, America's greatest orator began to deliver his famous lecture, "The Lost Arts," and the motive of that lecture was that modern science, unlike ancient science, devoted itself to the benefit of all mankind. He called attention to the fact that the secrets of the ancients which died with Egypt, died because the secrets were known only to the savants and to the rulers, and when the political government of Egypt was destroyed, they were the first to be destroyed and their secrets died with them, and Wendell Phillips preached from 1883 on, in that famous oration delivered more than two thousand times in America, that this was the great distinction between the ancient science and the modern.

It is fortunate for modern science that we have grown up in our country and in our age a class of men who are, in fact, idealists, who give their lives, their heart blood, their whole energy to research, to education for the benefit of their fellow men. I have been told this day about the action of kindness, the great charity, the great love in which the former Provost of the University of Pennsylvania, the Provost Emeritus, and the Professor Emeritus of chemistry of that great institution today is held by hundreds and thousands of students in that school.

It is peculiarly fitting that this, a congress of mining men, should have an address tonight on this wonderful subject of chemistry by an idealist, a man who has given his life to the subject, a man who is enthusiastic, has done for his countrymen all that any idealist could hope for.

I have great pleasure in introducing to you tonight Dr. Edward F. Smith who will talk on the subject of "Chemistry." (Applause.)

DR. EDWARD F. SMITH: Mr. Toastmaster, Ladies and Gentlemen: I said to the friend who was instrumental in having me invited to appear before you tonight that I would not deliver an address nor would I make a speech but I was ready to talk to you.

In my career of forty-four years as a teacher of chemistry in one of the old colonial institutions of our country, it was my pleasure for a number of years to teach the chemistry of our mining engineers which they expected to apply in their profession at a later date, but somehow or other we chemists felt that you mining engineers, while you had a taste of chemistry,

were not chemists, and chemists have done some things since you mining engineers have gone out from college and university, to which perhaps you have not given much attention.

Since you men went out from your colleges and universities, my science has taken out of this atmosphere, which tonight we are breathing and which we are constantly breathing and without which we would cease to breath, that rather sluggish element that you know all about, called nitrogen, transformed it into ammonia and that by certain simple processes into nitrates and made it possible for us to be absolutely independent of the great natural nitrate beds of South America.

You must recall how in the early years of the great war consternation prevailed in the armies of the allies as to what they would do in order to get that most important substance in the preparation of explosives, namely, nitric acid, inasmuch as the great German people had absolute control of those South American nitrate beds. And so the American chemists and the English chemists and the French chemists and the Italian chemists devoted themselves to extracting and fixing the nitrogen of the air in such a way that it could become available for the manufacture of explosives, and we were wholly independent of our South American friends. This is a remarkable achievement.

During the war while lecturing one morning to about eight hundred lads clad in khaki uniform, on a day that was fearful as to temperature and wind and what not, and when the doors and the windows had to stand wide open because "flu" was in our midst and hundreds were dying, I took occasion to speak to those lads of the fixation of the nitrogen of the atmosphere, calling attention to the many hundred thousand tons of nitrogen that were above us within a certain area, when one youngster off to the left said so that I could hear him (not to me but to his neighbor), "What did the old geezer say?" (Laughter.) The old geezer said: "Charlie, he is trying to tell you how the United States of America has succeeded in putting into the hands of its great army and the armies of its allies that much desired substance called nitric acid needed so terribly in the manufacture of explosives. You will know something about it when you go across."

Well, now here is a point that I would like you to take with you. It was when we were in dire distress, when we scarcely

knew which way to turn that the world turned to the humble chemist whose profession had comparatively little respect shown it by the world at large. It was the chemist who gave the boys new gases, first the chemist of the enemy, and that chemist was beaten by the chemist of England, and lastly all were beaten by the chemist of America. (Applause.)

But go back to revolutionary days when the colonies were struggling to become free and to develop into this great and mighty nation into which they passed. Even then those early chemists of this country supplied the continental forces with the gunpowder which was at that time the most powerful explosive known to the world. The nitrate that they used was scraped from the walls of stables, was gathered in the cellars of houses, was picked up in all damp places where nitrogenous, nitrogen-bearing substances grew and oxidized. There was a feeling of patriotism in the chemists of that day which manifested itself again in this great world struggle. In other words, I want you to believe that chemistry, the best and the noblest of sciences and the one without which man can't expect to get along, is the one to which all appeal at all times and particularly in such periods as the one we passed through a few years ago.

You men who are engaged in working up the store houses of nature, the great mineral resources of the United States of America, know that some years ago out of the pitch blend of Colorado and Arizona, out of the green sands of Colorado, they brought that remarkable substance known as radium, and not long ago it was my privilege to sit by the side of Madam Curie, the discoverer of that enigmatical substance to which she gave the name radium. What is radium doing today? Why is it that Madam Curie is giving her life, feeble as she is at this moment, putting every hour that she is not resting in the work upon that queer substance which penetrates, goes through solid material and shows its effect in such a remarkable way. It is for the sake of helping humanity. Radium in the hands of the physicians today is a godsend. It is bringing health, restoration to those who are perhaps in the last, last moments of life, bringing them back again. Madam Curie was careful to say that she was not certain that radium was a cure of cancer, although there were many cases on record in which cure had resulted from its application, but she was certain that it alleviated and that it

reduced the pain and the misery of those who were subject to that strange disease yet unmastered. But it came out of a mineral substance and we ought to rejoice that we have locked up, no doubt, in the bowels of the earth thousands upon thousands of things which are to contribute to the happiness, the comfort and welfare of mankind.

Within the past three weeks I have been permitted to look upon certain experiments which, while they are now just in the making, yet promise so much that I feel that I may say to you as men who are dealing with mineral substances that it looks very much as if in the residues from zinc distillation, down in that stuff that we cast away, there sticks another element called germanium, and the remarkable thing is that until very recently little of it could be found anywhere. It was discovered in 1887 but in 1893, when I served on Jury No. 86 at the World's Fair in this city and was permitted to look upon the exhibits of all the nations of the earth, it was only in the exhibit of the Germans that I saw just a teeny little bit of the oxide of germanium. I got down on my knees and begged that I might have a bit of the sulphid, but after consultation with the powers, they couldn't spare it. Now we have pounds of it taken from the zinc ores of New Jersey, but I mustn't get too far away from my story. The oxide of germanium injected into my veins or your veins will cause a multiplication of the red blood corpuscles that will astound you. You have heard of anemics where there is this excessive white blood corpuscle formation, where sometimes as a last resort some magnanimous person will allow himself to be tapped and his healthy blood admitted to the dying man. Germanium dioxide multiplies the red corpuscles in people of that kind, but, of course, the thing is tentative. This I must not give to the world or give it to you, but I would like you to think about it. I fancy that all the zinc ores of the United States of America carry this element for which there was apparently no use, and maybe it is another one of those remarkable gifts of providence to man. When you once have seen as many anemic patients as I have and have heard the remarks of physicians as to the hopelessness of the cases, then I think you will join with me in thanks for this new—I feel so positive—remedy that I want to call it that. But it was the chemist who found it. That was a part of his work. So that is another evidence of what the science means to the whole human family. It

comes to your desk, comes into your bosom. Take this substance water. Who cares about it (laughter), yet out of it the chemists, by proper methods, set free that oxygen gas which today many of you are using in connection with acetylene in your oxyacetylene blowpipes, and you know the intense heat that it produces and the welding that you can now perform, but which fifty years ago no one dreamed would be possible; but it was the chemist who took out of this cheap substance that element and when you are suffering from pneumonia, the doctor says, "Bring in a cylinder of oxygen," and tubes are put into your mouth and you inhale it and you feel I guess a little like the little mice did, the little mice of Dr. Joseph Priestley in 1884 when, after inhaling the gas they leaped for joy, ecstatic, so happy, and then laid down, but in time recovered. Now it is the chemist who has done these things. That is the science that is dominating the world today.

Most of us, since we have learned a little about chemistry, have come to believe that under God's sun there was only one people that knew any chemistry. Many of us believe that. We would have sworn on a pile of Bibles that it was so, but this great war has demonstrated that there are chemists in many parts of the world equal to the chemists of that great people who certainly advanced chemistry far, and today the chemists of the United States of America are capable of doing all that the chemists of Germany ever did, and more. (Applause.)

You must pardon me if I speak so seriously, but in addition to telling you of a few things which the science of my heart has done I have another purpose, briefly indicated in the last words, that the chemists of the United States of America are equal to the chemists of any nation under the sun. They produced the nitrates, they produced a thousand other things and today we have research going on in thousands of laboratories. Of course, Senator Nicholson is anticipating that I am going to say something about dye stuffs, because the members of Congress have had come before their committees chemists who told them something about dye stuffs. The chemists of the country have asked that an embargo be put upon the dye stuffs for a while. There has been resistancy on the part of our government in granting their prayer. Now, why do we ask for an embargo on the dye stuffs? These beautiful colors that we see about us every

day on all sides are largely products of despised coal-tar. They come out of a miserable looking substance that used to be carried into creeks and rivers out into the sea, but that is not done any longer. The Germans taught the world what that product contained and in this country we are today extracting from that substance the same colors that they extracted.

There will be those who will tell you the American dyes are no good, they are not fast; but as a member of the profession of chemists I ask you to believe me, as I know whereof I speak, that they are as good as any that have ever been made, but between the dyesuff and the thing to be dyed stands the dyer, and the dyer unfortunately has yielded to the gold that somehow or other comes before him and he has ways of so altering things that American dyes are not fast. If he could understand that he is an American, if he could believe that this great Republic stood for right and humanity at all times, the temptation and the lure of the gold would cease and there would be fast dyes. (Applause.)

We want a lot of patriotism in this scientific work that we are doing, we want all Americans filled with that spirit; it was the spirit of our fathers—men who gave us what we have today —and it is difficult for many of us to understand how people calling themselves Americans can appear before our representatives in Congress and tell them that this thing of an embargo is not necessary. It was an embargo practically that made it possible for Germany to reach the heights to which she attained in her scientific work. The government stood back of the chemists of Germany. All scientific endeavor was protected by the government, but for some reason or other here in America, where the government should stand behind the endeavors of Americans, she has failed. You may say, "You are a protectionist." Yes, I have become a protectionist because thirty or forty years ago I saw growing up in the state of New Jersey and the sand banks of Pennsylvania glass industries which were turning out production superior to anything that we had, but in three years' time those industries closed down. Why? The United States Government failed to protect the men who invested their capital in those infant industries. Not long thereafter I knew a man who invested a million dollars in an effort to build up what he called a nitrobenzol plant. In five years

his plant was closed and his money was gone; his government failed to protect him.

Now, are the chemists of the country asking too much when they come to our lawmakers, our representatives, and say to them, "You are pleased with the industrial developments along chemical lines, you are delighted to hear said that America can do in chemistry anything that others have done, or are doing."

"Yes, we are."

"Well, now, we will test your sincerity in the matter. We need protection; we call it embargo on dyestuffs."

There are those who say an embargo is an undemocratic thing, it won't do. We are not asking for it forever, but until some of these struggling industries can get on their feet and those who are willing to throw their wealth into the development are made to see that these things are going to be lasting, that is all we are after. And then others say, "Why an embargo on dyes? Why not an embargo on phosphorus, why not an embargo on other chemical products?"

The dyestuffs have required men of the highest attainments in their development, and if those great plants that we have close down and these eminent specialists go out into the world, a damper will be thrown upon every line of research, it will affect every branch of science, even the science of baking. That is the reason why. We don't want a wet blanket thrown upon these other industries at all. We have come up to the forefront in research in chemistry. We would like to stay there, but we can't hope to retain that position unless our government stands with us.

Now, there is one other thing I want to leave with you. That is this: In a few weeks there will assemble in Washington commissioners from various nations who are going to discuss the question of disarmament. The chemists of America would like to put it this way to you: they would like to have discussed the question of chemical armament. Future wars are not going to be fought with battleships. Battleships are going to be of no use. Things have been developed within recent years that will put them out of commission. It is going to be the science of chemistry that you have got to deal with, reckon with, and that nation which leads in the production of chemical warfare substances isn't in the meeting at Washington.

An eminent American said to me not long ago, "What recommendation do you make on this point?" And the only answer that could be given him was, "To endeavor to keep ahead of that nation."

In what way? In the production of destructive materials. This is a very serious problem that is before the representatives of these governments. Why, all those great dyestuff plants on the Rhine can inside of four weeks be transformed into laboratories for the production not only of mustard gas, that is nothing as compared with some of the things which have been discovered more recently, but they will be used for that purpose. How can we prevent that use? You know the chemist sees two sides, he sees a period of peace in which his science is active in doing something for mankind, helping forward civilization, and he is conscious of another side where just by the pressure of the finger there will be let loose forces that will demolish immense territories, for there will be set free noxious gases that will kill by the thousands and tens of thousands. This is not an exaggerated picture. Chemists don't feel so very comfortable when they take into consideration both sides. But we hope for the best, we hope that some enactment will be found by which even those who can manufacture these harmful chemical bodies will be so placed that little bad result will come from them.

As a chemist, I often think of what the science was when I began its study and what the science is today. I remarked a while ago that it comes to your table, it comes to your bosom, it enters into your whole life. An engineer flatters himself that his science is pre-eminent, but he couldn't accomplish the things which he has achieved had it not been for the science of chemistry.

We chemists would like the laymen of the United States to become familiar with at least some of the results of his experiments. I have indicated just one or two; I might occupy an entire evening, and, for that matter a day, and not have exhausted the story of his consequences. It is really marvelous and wonderful and we ought to take pause now and then.

We of the American Chemical Society are striving through our sixty-five sections scattered all over the country to come in contact with the people, to tell them some of the things

which have been brought to light by our science and how helpful it has been to them and how much more helpful it may be in the future and get them to understand why we make this appeal to our government to protect us in what we do, in our efforts.

We don't want to be discouraged and feel that there is no future for the science. You may say to me, "Why, she has gone forward pretty far without that governmental protection." She has gone far, but not in this country did she go as far as in Germany, where she had governmental aid.

When you look at one of these electric lights you know that the filament in it is the metal tungsten, you know that for years these tungsten lamps were a failure, and it was only after the chemist, by careful research in laboratories away from the noise and bustle of the city, men buried in little rooms, thinking only of what the trouble was, striving year after year until eventually they were successful. That is the kind of work they do. That is one of the boons they confer upon humanity, and so I ask you mining engineers to, when in the near future you are sure to hear of the efforts that will be made to establish firmly here in the United States of America these industries that are now ours and are going forward successfully, back them up, back up the newer industries, those that are just beginning.

We would like for you to give these things serious thought. You are first cousins at least, you have come in contact with the elements with which we are dealing daily and you know that there is no camouflage about what we tell you. You believe us because you have had in your student days, and many of you since you have gone out into the world, evidences of the marvelous powers of this old science, and we would like your moral support at least in the things that we are trying and getting the rest of the country to understand. We have no selfish purpose in it.

I don't stand here as the representative of any great corporation. I am not subsidized by anyone; I never ran a great chemical industrial plant; I know nothing about the inner workings of such a place; I am just a chemist through whose hands has passed almost every element known today.

We need the patriotism of the fathers of 1776 and the years following in the first quarter of a century; we need more of that. Of course, as an American I feel America comes first. I am willing to share her good things with others, but I don't want my country pushed into the background, I want her to avail herself of every opportunity offered her to stand where she is today, in the forefront. That is why, gentlemen of the American Mining Congress, I said to my friend, I would talk to you a little while rather than make a speech or an address. This is such a talk as I would deliver to a class in chemistry if it came before me in such an informal sort of a way.

And now, Mr. Toastmaster, I have completed my story. The continuation will be made by one who is known to you all intimately and who has his own views perhaps about some of the things upon which I have spoken.

TOASTMASTER MOUNT:

Being a layman, I may perhaps be permitted to indulge in the hope and the belief that through such efforts as this eminent scientist has displayed here tonight, this great body of science—chemistry—the very handmaiden of science, shall be the "Open Sesame" to eternal peace and not to war. (Applause.)

I said I wouldn't tell any more stories. I am not going to, but I am reminded in that part of the program yet remaining, of a little personal experience that came across my way a few years ago in Canada. I was permitted to attend a dinner of lawyers. I don't mean we dined on lawyers—but the guests were lawyers, in the city of Winnipeg. We were disposed about tables like this. Each of us at our table indulged in a story for the entertainment of our immediate neighbors. I put mine across, which was a good Hoosier story, the authenticity of which I was certain I could bear against any sort of challenge. I thought it went over pretty good. Up at the speaker's table a number of eminent barristers and K. C.'s were busy. Finally one of them, an old judge who had been wearing the ermine of Winnipeg for thirty-five years, and who spoke with such a French accent that it was a little difficult for me to understand him, proceeded to reminisce about the early days in the judicial history of Winnipeg. Straining my attention, hearing some familiar phrases, but not able to catch it all, I asked my neighbor, "What is the judge saying?" With a quizzical look he said to

me, "He's telling your story." (Laughter.) Of course, it happened in Winnipeg because the judge *said* it did. Of course, it happened in Indiana because I *knew* it did.

Maybe you would like to know what the story was. You seem to be in a friendly frame of mind, so I'll tell it. We have down in Indiana what is known as the lowest form of juridical life—a justice of the peace. (Laughter.) Out in one of the townships in my native county, the untrammeled and free electors had selected a new man as justice of the peace, and the first case that came before his court was one involving some sort of damage between two neighboring farmers, I think out of a line fence dispute. Counsel for the plaintiff was a very scholarly, dignified, uncholeric gentleman. Counsel for the defense was a happy, witty, Irish lawyer. The trial was called in the neighboring schoolhouse. All the neighbors came in, of course, to see how the squire would get along with his first case. On assuming the bench, with counsel and litigants before him, the squire, with great dignity, rapped for order and said: "The case of Jones against Smith is now ready for trial. Are counsel ready?" The dignified, scholarly Colonel Wilson arose and said, "May it please your honor, the plaintiff is ready." Turning to the Irish lawyer, he said, "Is the defendant ready for trial?"

"May it please your honor, before opening this trial I wish to make a motion. I wish to move, sir, that the defendant be discharged"—and before he could say, "for the following grounds and reasons," and set them out in proper form, the squire, with a wise look, said, "Do I hear a second to that motion?" The Irish lawyer punched his client and said, "Second the motion," which he did, and over the purple protests of the scholarly gentleman and to the glee of the neighbors, the squire put the motion and discharged the defendant. (Laughter.)

It would be trite for me to say how much I personally enjoyed the meeting of this Congress. I visited your exhibit this afternoon; it was a very good exhibit; it had to be—I paid fifty cents to get in. After seeing all that machinery, that splendid equipment down there, it occurred to me that coal, zinc, steel, iron, and all the metals ought to begin to get pretty cheap now.

Of course, in your deliberations as a Congress you have discussed matters of peculiar nature to your business. You have no doubt concerned yourselves with some of the vexatious

problems which now concern not only you and every business man, but every citizen—problems which have reason to give everybody pause. We all have them. I would like to tell you some of mine, but you have been listening to your own and I am not going to inflict any of my own problems on you, or the problems of the industry in which I have the honor to be engaged.

These are strenuous times, but there is no need to be discouraged. America is most fortunate in having developed a type of business man unlike any other in the world, in having developed business leadership—men of broad vision, men of great souls, of optimism, if you please, men who go on and on building into the future not merely for themselves and their fellow-citizens, but for those who shall come after. It is a type, it seems to me, for which our country is peculiar. These men are makers of history—more makers of history than generals in the field or statesmen in our capitols.

In all this great galaxy of business men, I know of none more able, I know of none more hopeful, more useful, than one whom we have here tonight. Having accomplished great things in his own industrial life, yet the value of his achievements along those lines are as nothing compared to the value of the tremendous example of the man. His works speak for themselves; I could add nothing to them. I cannot tell you anything about him that you do not already know. With his indomitable will to do, always wearing a kindly smile, backed by a mental equipment as broad in purpose as it is noble and prophetic in vision, he has accomplished much and has hardly yet begun his labors.

I have great pleasure in introducing to you this splendid type of American business man who will discuss our industrial problems, Mr. Charles M. Schwab. (Applause.)

MR. CHARLES M. SCHWAB: Mr. Chairman, Ladies and Gentlemen: A simple pig-iron manufacturer and steel maker from Pennsylvania starts out under rather inauspicious circumstances in listening to such an introduction.

I must tell you a story first, because I think it will help you to have a true appreciation of my own opinion of myself in contradistinction to the flattering opinion that our good toastmaster has given you. He speaks of my many accomplishments and the things I have done in the world, and all that sort of thing,

which are really quite new to me and I have never learned about them myself, but I feel very much like reciting this story as illustrating how I do feel.

I was in London a year ago, and one day I saw a man who looked a very fine gentleman and as if he might be a very distinguished man, and to mark my approval of his appearance he was decorated with medals from one shoulder to the other—medals of distinction from every government and society apparently in Europe. I said: "Now there is truly a distinguished man. I must know him and make his acquaintance." I went up and I spoke to him and I said, "Do you mind telling me why you wear so many medals of distinction?" He said: "I'll tell you with great pleasure. This first large medal that you see on my left I received by mistake, and I have had all the others because I got the first one." (Laughter.)

You know it is a difficult thing for me to know what to say to you people this evening. This is the first time that I have willingly faced an audience this year. I promised my wife at the beginning of the year that I would learn how to say the word "stop," and I did learn and I haven't attempted to speak. Charlie Piez here came on and said, "I want you to promise to come to this Congress." I want to take occasion to say in Chicago, the home of this distinguished man, that there is nothing that he can ask of me to do that I won't willingly do. First of all, I was associated with him most intimately and most closely during the great trials of the war; and if I say it here tonight it is not because I haven't said it a hundred times elsewhere, that there is no man in the United States that deserves as much credit for what the United States did in this war and its accomplishments as does this modest gentleman who sits here at my right. (Applause.) There is nobody who has been more appreciative of what he has done, there is nobody who has been more willing to recognize what he has done, than I.

When I went to Washington at the head of the Emergency Fleet Corporation and met Charlie Piez, I had never met him before. He was talking of leaving, and I said, "Now wait, Charlie, I'm not going to stay here unless you stay with me." That was after a few days' acquaintance. He said: "I'm not so sure about that. I'm not young, I am set in my ways, and I am accustomed to doing things my own way, and I don't know

how we will get along together." I said, "Hell, Charlie, you're taking no more chance than I am." (Laughter.) And he wasn't, and the result is a friendship that is not only very dear to me—I hope it is equally dear to him—but one that I sincerely trust will continue during the remaining years of my life, my dear friend Charlie Piez. That is why I am here first and primarily.

Secondly, when I meet and see so many of my friends about, I am delighted that independent of Charlie Piez I came out to Chicago to meet Mr. Markham and so many of my delightful friends here, and I have had a real happy visit.

As to speech-making, like the Professor, I just sort of ramble around and talk as I feel like it, and that is the way I am going to talk to you tonight.

I first want to take up the speech of the distinguished Professor, to which I listened with so much interest. He rode over from Cornell College with me last night, and I made a wager with him before he started that he couldn't make as good a speech as his conversation was with me last night. Well, it's a draw. I am the only one that can decide that, and they were both equally interesting.

And yet, when he attributes all these wonderful things that have been done, to chemistry, I sometimes think of the great authority that I had in steel in my early days and whom I believed in so implicitly that I thought everything he said was right. He was old Capt. Bill Jones, the first great steel maker, of whom Henry Bessemer said, "That man has contributed more to the development of the steel industry than any man who ever lived." Capt. Bill came into the steel life just about the time chemistry commenced to play an important part; we were just beginning these arguments about carbons and silicons and phosphorus and so forth. He was puzzled and fell back on me, who had a little smattering. But one day, in his bewildered puzzlement and indignation at this new innovation in steel making, he said to me, "Charlie, this damned chemistry is going to spoil the steel business yet." (Laughter.) Therefore, I quote an eminent authority in contradiction to what the learned Professor has said to us this evening. You can take your choice. I don't know which is right, but we know that we have advanced.

I once employed a man who thought he knew something of chemistry, to sell steel rails. He was a good old Chicago man, since deceased, Mr. Morton. He thought he could sell rails. He

started out, and some railroad manager or president here in Chicago said to him, "I would like to buy rails from you, but we could get rails from the Lackawanna Steel Company with only five-hundredths of a per cent of phosphorus in them." Walter said: "I don't give a damn how much phosphorus they put in them. We can put in just as much as anybody else." (Laughter.)

You know, I don't agree with the Professor on his ideas about this battleship business, because I build battleships. (Laughter.) One's views are always or often varied and become very pronounced under existing conditions that surround the viewer, but there are some things about this that have well illustrated themselves.

As a sequel to this little story which I tell about Capt. Jones, there is another one. The Captain was very fond of a race horse—a fast trotting horse. He went down to the farms of Kentucky to buy a good, fast horse for himself. They took him into one stable and showed him a whole line of horses that had trotted a mile in three minutes and some in two and a half and two ten. Then they showed him a lot of fillies and colts that were going to go a mile in two minutes and some in two one, and Capt. Bill, after looking them all over, said: "Well, I've seen your has-beens and I've seen your going-to-bes. Now what I want to know is have you got any 'isers?'" (Laughter.)

For the protection of this great country for the future, I am quite willing to believe in the prophecy or ideas set forth. We know what has gone in the past, don't let us take any chances as to what the "going-to-bes" are going to be until we know what they are going to be, and depend for the protection of this great country of ours upon what we know is the best that we do know today.

When the Professor tells us that he will guarantee the safety of this country from his splendid advanced ideas, nobody will be quicker to adopt them than I. I want to take this opportunity of saying that I am as strongly in favor of disarmament as any man in the world. I don't believe that any good, sane, right-thinking American or man of any country can think otherwise than that we ought to disarm if everybody will do the same thing, but don't let this great and glorious country of ours, endowed with all its riches, its natural resources, be at the mercy of any

other country in the world until they are equally situated, with reference to disarmament, to ourselves. (Applause.)

Let us throw away every gun and every ship we have got that is meant for the protection of our country if every other country will do the same thing. There must not be any makeshift, there must not be any diplomacy. We don't excel in diplomacy as I understand the term—we are too honest for that. But still, until that has been accomplished—well, let us take care of ourselves, boys. That has been our motto in the past, it has been successful, and let it be our motto in the future.

Now I am going to come to something serious pretty soon. I haven't got quite warmed up to it. Charlie Piez always sits alongside of me and tells me what I ought to say and when I ought to say it.

I haven't come to them yet, but I have some serious thoughts tonight. I haven't publicly spoken of a lot of these things. I jotted them down on a piece of paper. I read them over to see how long it would take, and I can read them in four minutes and a half. Now if you have patience with me until I just read these notes for four minutes and a half, I will have finished the serious part of what I am going to say to you and indulge in a few generalities of a business character that may be of interest to you. But I don't want any mistaken ideas or any misquotations or anything else with what I propose saying to you on this subject here this evening. I think I can say this is the first time in my life that I ever read from a manuscript or anything that I had written in a public address. I ought to have done so; of that I am well aware.

Last year I came out here to make an address, and someone said to me, "Mr. Schwab, have you a copy of your address?" I said, "I never prepare my addresses."

"Well," he said, "I have read some of them, and now for the first time I understand." (Laughter.)

As a large consumer of iron ore and coal, and as a producer of both, I am naturally deeply interested in the problems of the mining industry, and in the efforts which the Mining Congress is making to arrive at their solution.

To my mind, there is nothing in the present business situation which time and the laws of trade and economics will not straighten out. The danger lies in the effort to force an adjustment through legislation.

We are in difficulties, there is no doubt about that. Prices have dropped irregularly, wages have gone down in some lines, and are maintained in others; short time has reduced the earnings of many workmen, and unemployment has put a heavy burden on many more.

The products of the farm have dropped to about pre-war levels, and the high cost of transportation invades deeply the farmer's narrow margin. Yet the railroad workers resent any reduction in rates, and the changes in rules provided in the very wise award handed down by Judge Landis. Everywhere the process of readjustment is creating discord and discontent. Everywhere our people want to hold on to what the war brought in the matter of increase in income, and want to lay the sacrifice involved in deflation on some other back.

It is perfectly natural for a baby to cry when you remove the bottle before it has had its fill. It is perfectly human to resist a reduction in one's income and to submit only after a considerable argument and effort.

What a splendid world this would be if we could get back to normal by the mere process of passing a few laws. We have tried legislation on some things and it has not worked well. We have tried directive control of our railroad systems into a single hand, and the memory of that experiment is still vividly with us. Russia embarked on the plan of centralizing the control of all industry in government hands, and no one is anxious to take another chance at that experiment.

Yet many of our people clamor for the relief through legislation whenever, after an orgy of prosperity, economic laws insist on reasserting themselves. And our legislators are altogether prone to yield to these clamors, with the result that inelastic, repressive legislation checks initiative and thwarts enterprise.

I know of no better stimulus for creative ambition than the hope of personal reward. I am going to tell you what I think are the real facts. You people may criticize them, and you may speak of generalities all you like, but back of a great initiative is the stimulus of personal reward. Many men think it is not a patriotic or wise thing to do to speak of the personal element with reference to great enterprise, but I believe, and I always will believe, it is the one great stimulus that will lead to initia-

tive and the development of our great resources and industries in this country.

Intelligent self-interest, not selfishness, cannot be equalled in securing results in business. It surpasses any form of communal co-operative effort. And when competition has free rein, there is ample restraint and ample protection to the public interest.

The American business structure is the result of over a hundred years of initiative, enterprise, courage and effort. It has grown to its present size because it has learned through many hard knocks to conform to sound economic principles. Those twin brethren, supply and demand, have in the long run fixed prices fairer to the consumer than could the wisest commission sitting in Washington, and they have imposed heavier penalties for errors of judgment than would a bolshevist court.

I need only point to the terrible losses in silks, in leather, in sugar, within the past year, to indicate the severity of the penalties to those who guess wrong, or who fail to observe economic laws.

What I am trying to get over is that economic laws are constantly at work checking excessive consumption and stimulating production by raising prices in times of great demand; and reducing production and encouraging consumption by lowering prices in times of depression.

There is no commission or governmental agency that could adjust the balances as well or as wisely. At the very time the government is trying most desperately to get out of the shipping business, it seems to be headed straight for the coal business.

The high prices prevailing for coal during the past year are generally supposed to be due to a combination of the great coal producers, who, by the power of monopoly, have raised prices to extortionate heights. It is also supposed that the coal deposits are approaching exhaustion, and that for both reasons government control or at least regulation of the industry is imperative. Yet the testimony given some months ago before the Senate Committee on Manufactures, showed that there exists in the United States proper, some eleven thousand coal mines controlled by seven thousand operators.

The greatly increased demand for coal incident to the European War, as revealed before the same committee, almost doubled the number of mines, so that the fifty-seven hundred and seventy-six operations existing in 1913 increased to eleven thousand in 1920.

Can there be monopoly in an industry so widely distributed, so widely owned? The very fact that so many new operations started as the result of increased demands, shows that there is no monopoly in the ownership of coal deposits, for a monopoly has altogether too much sense to spread itself in this fashion.

The coal deposits, not counting Alaska, were stated by government experts and coal operators to be between three and four trillion tons. You can't comprehend that.

I want to tell a story at this point. It is illustrated by two tramps coming East one time in a freight car. To while away the time they thought they would play poker. They had no money, so they used grains of wheat. They each got a good hand. One fellow said, "I'll raise you a thousand." The other fellow said, "I'll see that and raise you a hundred thousand." The other said, "I'll see that and raise you a million." The other said, "All right, I'll raise you a billion." The other fellow said, "Aw, take the pot, you educated son-of-a-gun; I don't know what a billion is." (Laughter.)

My friends, when we come to talk about billions of tons, we don't know what it is. I once knew a great astronomer. He gave a lecture one night that I attended with him. He was telling all about the stars and their distance from the earth and their rotations through the heavens, and he was talking of trillions and quadrillions and figures that were inconceivable. After the lecture we rode home on a street car, and two workmen who had attended the lecture were sitting opposite us and were talking about it. One man said, "That man is either the wisest man in the world or he is the damnedest liar."

I have been in competitive industry so long that I am constantly on guard against an increase in overhead, and I am opposed to the creation of new methods that transfer men from the producing column to the overhead column. I have to be shown that the transfer will bring returns, that it is in reality helpful to production, before I give consent.

Yet we have witnessed for some years a constant increase in our national and state overhead expenses. The creation of new departments for supervising this, regulating that, or controlling the other, has been going on merrily; and with each additional function assumed by the state or nation, some person or group of persons has been transferred from the producing to the overhead group. No manufacturing plant would thrive very long if it continued to increase the personnel of its office by reducing the number of workers in its shops.

We suffer today from an excess of national, state and municipal overhead. There are too many of our people employed by our various governments, and too few in productive industry in normal times. Every time you create a new commission, or new government department, every producer groans under an additional burden.

I feel most strongly that our legislative bodies and our legislators ought to bear this fact in mind, and that they ought to give American industry an opportunity to adjust itself without loading it up with any further overhead.

I don't want to take your time to go into the details of high coal costs, but I want to submit just a few thoughts that have occurred to me as aids to an improvement in the bituminous coal industry. Undoubtedly you have had the same ones many times, but they will lose nothing by repetition.

The productive capacity of your mines in normal times is fifty per cent. greater than your demand, and it follows, therefore, that your mines, even in fairly prosperous times, must shut down a third of the time.

It means that 700,000 men must be idle one-third of the time and that their wages must be increased so that they can live for twelve months on the earnings of eight. It means that two billions of capital invested in the industry is profitably employed during only two-thirds of the time, that deterioration of timbers and machinery during the idle time must be paid for, that pumping and ventilating machinery must be kept going whether there is coal output or not. And all these adverse factors which add so materially to the cost of coal must inevitably be passed on to the consumer.

Your problem is to distribute your demand more uniformly over the twelve months, and this can only be done by such a

concession in price as will induce large consumers to undertake the expense and suffer the deterioration of heat values incident to storage, and to pay the interest on the investment.

The waste due to the intermittent operation of the coal industry is a heavy public burden which ought to be reduced, and only a distribution of the demand over the twelve months' period will do it. Make it worth the consumer's while to store the coal and he will do so. There, I believe, lies the solution of one of your major difficulties.

The fundamental basis of all successful industry is economy. I used to go to Mr. Carnegie when I was with him, and with great glee and joy in my heart say, "We have made $500,000 or a $1,000,000 worth of steel this month," or whatever it was, and he would say to me, wise man that he was, "That doesn't interest me, that is a matter of incident. Show me what it cost you to produce your steel and then I will know you have got the business on a basis that will make a profit for us." Economy is the basis of all successful business, and every step we take we ought to bear fundamentally in mind that one great principle of economy— how cheaply can we produce?

No man wants to see American workmen get better wages than I. I want to see them have the highest wages that are consistent with the right living that American workingmen ought to have. But if American workmen will just give us a full day's work for a good, full day's pay, American industry need fear the competition of no country of the world in any line of industry. (Applause.)

I have heard many learned discussions on this question of capital and labor. People get up in the most glowing and eloquent manner and advise capitalists to meet on a common plane with labor, and advise labor to be patient with capital, and all that sort of thing, but I have yet to hear any one get up and tell how to do it. That is the practical problem that faces us. It is all very fine to spin these theories, but how are you going to do it?

I am going to tell you my personal experience upon this matter. It may be of interest to you. The Bethlehem Steel Company, in which I am interested, had a very large number of employes. At one time—two years ago—we had 180,000. To-

day we are down to 80,000—100,000 less than we had. I have been a manager of labor for forty years of my life, and I have never had a union man work for me. I will tell you how we have solved the problem. I am not opposed to unions. Unions have been a good thing for men properly directed and properly conducted. Men have just as much right to have their associations for the protection of their industries as capital has; they have just as much right to be heard as to their grievances as the capitalists in industry have, but you must give them that right and put it right, and you must trust to the good sense of American workmen, in my opinion, to do right.

Now, the principle that I went upon was this: that if this great United States of ours, which we as a great citizen body govern, is right, the same principles ought to be applied to a great industrial establishment or a great railroad—any great enterprise employing men. Therefore, we adopted, twelve years ago, the plan of allowing all of our workmen to select for each three hundred workingmen a representative from their own shop and their own works. I didn't permit a labor agitator from Oklahoma to tell the men in Bethlehem what they ought to do. I said, "You select a man from your own shops, one for every three hundred." They constituted the House. The management of the Bethlehem Steel Company constituted the Senate. They met monthly. All the questions of wages and conditions were taken up by this body, and in this great number of years we have never had a serious dispute, and during this last period of depression we have placed the facts of business stagnation and conditions before our workmen and they have cheerfully submitted to a reduction in their wages of some thirty or forty per cent. without a dissenting vote on the part of any man. When the time comes that we can afford to pay them more, we will with equal honesty give them all the facts and say that we believe they ought to have more wages. (Applause.)

Gentlemen, it is a fact that surprised me very much to look over the records of the questions that came before this conference upon the part of the men and upon the part of the Senate, and I am obliged to say that in seventy-five or eighty per cent. of the cases brought before it for discussion, the men were right. We who govern these great enterprises don't know

the conditions of many of our workingmen. We have had a lot of autocratic sub-foremen who have discharged a man because he didn't like him or because he smoked the wrong kind of cigar. That wasn't fair to the men and these men were afraid to come to you or to me and tell us the facts because they feared discharge. When there was open and free discussion in a congress of equally fair men, the foreman was made a better and a bigger man because he commenced to realize the human nature in all men, and the men were made better men because they were not afraid to openly discuss the questions that were for the benefit of the whole enterprise. Therefore, I am a believer that these troublesome questions that have been brought about by the great and strong labor organizations that are looking only to the good of the labor organization will be largely solved when the employer and the employe can sit down weekly or monthly and with calm and judicious spirit discuss the various questions that come up before them.

We have all changed in this country greatly since the war. We are not the same class of people. I was interested in the professor's talking of optimism of old. You know, one thought occurred to me there that it seems to me we are going back to original principles. The alchemist of old worked in the dark cellars and caves and he was almost ashamed to have been known. He wasn't called a chemist. One of the great problems for the happiness of the American men, it seems to me, may be the work that chemists are doing in some of our dark cellars here in Chicago. (Laughter.)

Gentlemen, there are more important chemical problems to be solved than these pertaining to mining and metallurgy and things of that sort if you want to bring true happiness to this great democratic people of America.

You know, we are a great democratic people. We are not the autocrats that we used to be. A man feels happy to grasp a workingman by the hand that he knows is an honest man and a good fellow, and he feels differently toward him. Frank Peabody can ride around in his private car, but when he gets off at the station he finds amongst his friends the brakeman and the fellow that he knew ten years ago in the coal mines, and he meets him and feels just as happy as can be.

This evening, when I came into this hotel, a colored boy came up and said, "Mr. Schwab, I crossed the sea a year ago with you," and I remembered him.

I will tell you a story that illustrates the honesty of the average American workingman and the average American citizen of the cities and streets and works and mines. On that trip, one day there were standing on that steamer 10,000 of the colored troops. I saw a big colored fellow looking very disgruntled. They were buying oranges and apples and candy, and I said to him, "Why don't you buy some?" He said, "I haven't got any money." I said, "Why haven't you got any money?" He said, "They didn't pay me before I left." "I said, "I'll loan you a dollar. I won't give it to you. Americans don't want to beg. I'll loan you a dollar and you tell any of your buddies on this boat that wants a dollar that hasn't any money to come to me and I'll loan it to him. You can return it when you see fit." I was interested in the experiment, having started it, and I loaned, and kept a record of all the loans, one hundred and forty-two only out of the ten or twelve thousand men, one dollar each; no more, no less. I gave them my card. You will be pleased to know that out of the one hundred and forty-two, every one came back but one, and that man is probably ill or dead or some unforeseen circumstance prevented his returning the dollar. (Applause.)

Gentlemen, why deceive ourselves? Why imagine that we, the people who sit here and govern great industries are of a different or better type than the average man? I don't believe we are. From my experience with men at large I find that the average American workman is just as sterling a character and a man of just as much integrity and honesty and honor as we, the men who apparently occupy a higher plane in the social life of this country. (Applause.)

I find that this great democracy has taught us these lessons. Many people believe, when they grow rich like some of these gentlemen that you see here on the platform—those that are rich nudged each other. (Laughter.) You know, I tell a story about the impossibility of realizing riches or the fact that you are rich. Some years ago Mr. Carnegie, who was a pretty rich man, and myself went up to the State College to dedicate two buildings that we had given. He had given a great library and I had given an audi-

torium as the first gift of a Pennsylvania citizen to Pennsylvania education, and on the way up we dressed and put on our evening jackets, and we were going to leave immediately after. I had a private car, and I had a valet. Mr. Carnegie went in and dressed first; then I went in to dress, and I found this valet, a typical big Englishman who looked more like the master than the master did, under the bed on his stomach. I said, "Charles, what are you doing under there?" His face was red and angry, and he said, "Mr. Charlie, I'm going to quit; I can't work for you." I said, "What's the trouble?"

"Well, I quit now. I can't work any longer."

"Well, now, what's the trouble?"

"Here you two fellows go up here and each give away a million dollars, and you have one damned collar button between you, and I've lost that." (Laughter.)

I tell another story that always amused me about working men. When I was manager of Mr. Carnegie's works, I was going through the Homestead mill with Mr. Carnegie one time as a young superintendent, and I was very proud of the position, proud that I was in charge of this work, and with a head that corresponded with my pride. I was anxious that everything should be right and that this owner of this great establishment couldn't find fault with my management. We were going past an open-hearth furnace, and down in the pit was an Irish workman seated on a wheelbarrow leisurely smoking his pipe and not doing anything. I thought this looked bad. I called down and said, "Hey! What're you doing down there?" He looked up and said, "And who are you?" I said, "I am the manager." He said, "Young man, you've a damned good job; now take care of it." (Laughter.)

Charlie Piez and I were out in a shipyard on the Pacific Coast one day walking around with the superintendent, and there was a slacker there, and the superintendent discharged this fellow. As we were going through, the superintendent saw this fellow, and he said, "Look here, I thought I discharged you yesterday." The fellow replied, "You did, and don't you do it again, because my wife gave me hell last night." (Laughter.)

You know, gentlemen, these are the things that make us feel the pleasures and the happiness of life. Let us look at things and just smile. Today at the meeting with Mr. Armour and all the rest of them, when we were all so blue, Ogden said, "I have never felt so

blue. I'm losing money and I have never owed so much money in my life." I said, "Ogden, the thing to do is to do as I do. The more in debt I am the more I laugh. I feel like laughing at the plight the other fellow is in that has loaned me the money. I don't think of whether I am going to be able to pay it back again or not. Let him worry about that." Always laugh and keep in a happy frame of mind and things will look differently to you.

We are in a very serious depression now, but, as I said today, we have just had a great spree of success and wealth and we have got to pay the bill the next morning in the cold, grey dawn, and we are in that cold, grey dawn now, and we have got to pay the bill now and we have got to go through this experience. When we are all through, the country will be on a firmer basis and we will go on to better prosperity than we have ever had before. Don't let us be discouraged.

I told of a German workman I had during the Homestead strike. He came one day all covered with mud and grease, and I said, "What happened to you?" He said, "Those strikers threw me in the sewer." He looked like a typical representative of the present business condition, all covered with dirt and grease and mud as he was. I said, "Alpen, what did you do?" He said, "I yust laugh." Let us just laugh at these things. Let us not worry about them. If we have borrowed money we will have to complete the enterprise and let us borrow more.

At our works in Baltimore we are working twenty per cent. Before I left Bethlehem this time we appropriated many millions of dollars to be spent now when we can erect our works at the cheapest possible cost, because we believe in the future prosperity of this country, and this is the time to construct your works and be ready when that prosperity comes. (Applause.)

In my forty years of business and business construction of great works I have never yet, however wild has been the dream, builded a works that proved to be sufficient in capacity. They have always had to be enlarged and made greater. I sometimes sit up in my country home and dream dreams of the future. I was going to tell you a story that is a good story, and I must break in at this point, when I speak of my country home, to tell it. You know, I am a farmer now, not a manufacturer, and when I consented to come down here after Charlie had asked me to come, I felt in the same position of the fellow up there who came to sell me a cow. I

have a fancy lot of cows and this old farmer thought I was easy and he would sell me, and I said, "Is this a thoroughbred, a pedigreed cow?" He said, "I can't just say that." So I said, "Well, how much milk does she give a day?"

"I can't even tell you that, but I'll tell you one thing. She is a good-natured old cow, and if she has got any milk she'll give it to you." (Laughter.)

I sit up there in those mountains where, as a boy, nearly sixty years ago, I used to dream dreams of the castles in Spain, as to what life was going to be and what this world and this great country was going to be. And I am going to tell you that the wildest flights of youthful imagination in those days have been more than surpassed by the real development of realities in the years that followed.

Let us hope and know and demonstrate as a fact that your businesses in the future, the enterprises in which we are all so concerned, the great industrial establishments of this country, are going to expand in the future as they have in the past, to my way of thinking, with accelerated speed. We are going to have times of depression, of course. We don't want all prosperity. With all prosperity we would not make advances, we wouldn't learn economies. I am preaching economy all the time. The only one that listens to me is my wife, and I haven't made much impression on her.

The other day she came to me with a statement of my farm. I was telling her that the farm was not doing well, it was all a mistake. (You know, when the farm is losing a lot of money she is running it; when it is going well, I run it.) She showed me a statement to show that she had sold a thousand tons of hay for $40.00 a ton and her superintendent had shown that it only cost $20.00 to produce. I said, "Let me see that statement." She handed the statement over and I looked over it and said, "I don't see any labor in this at all." She said, "Of course not; you pay that." (Laughter.)

Still I am preaching economy, and I practice economy as far as I can. Sometimes it doesn't pay to practice economy to the fullest extent. For example, I ride around in a private car, so do Peabody and Charlie Piez and Ogden and the rest of us that have large sums of money to borrow, and do that sort of thing,

but if we ever stopped doing it people would say, "Hell, what's wrong with those fellows? They're not going to be able to pay their debts and we won't loan them any more."

I borrow money when I can. If I have belief in a thing, I go ahead and I won't spend anybody else's money if I am not willing to spend my own. If I believe in an enterprise and know that that enterprise is going to be successfully managed, I will spend all the money I can get a hold of, and do it with perfect ease and conscience, with perfect safety, because I believe in the future of this great and glorious country of ours. I believe that the United States is destined to be the workshop of the world; not only has it the natural resources of which the Professor has spoken, but something more important than that. This wonderful chemistry of his has gone so far as to almost transmute pig-iron into gold. But there is one great problem in the laboratory of the United States that is greater than radium or any of the things that he has spoken of, and that has been the transmutation of the American character from the pioneer and the rugged character of the nations that sent their people into this country of ours, into the sturdy American of integrity, honor and uprightness that will make the natural products of this country of real value to the rest of the world, and the United States the workshop and supplier of all nations in the world.

And so, my friends, that is the transmutation of the laboratory of nature that is equally great with the laboratory of the great scientist that will go on for fuller and more final completion to these great results. Let us buck up our courage, let us have faith in the future. Above all, let us have faith in ourselves.

I can talk this way because I am so deeply in it that whether I get out or not at my age doesn't make much difference, but take it from me that that is right. Let us go onward and upward with confidence in ourselves, in our country, health, happiness, prosperity, and, above all, that which brings the greatest throb of satisfaction to the heart — undertaking successfully accomplished — and we will all live in this God's great country with peace and happiness in the years to come.

I thank you. (Applause.)

EIGHTH GENERAL SESSION

SATURDAY MORNING, OCTOBER 22, 1921

The meeting was called to order at ten-thirty by Secretary Callbreath. A motion was duly made, seconded and carried that Secretary Callbreath act as Chairman until the arrival of President Loring.

CHAIRMAN CALLBREATH: The first in order will be the report of the Resolutions Committee.

MR. DICK: I believe, Mr. Chairman, that a number of the resolutions that were offered by the Committee were reported back to the Congress on Thursday. I will take them up in their order and give you the action that was taken.

Mr. Dick read Resolution No. 3, as amended by the Committee.

RESOLUTION NO. 3

Introduced by Horace F. Hunt, Colorado

WHEREAS, the Metal Mining Laws of the U. S. have been in effect for more than fifty years and during that long period have been interpreted and made definite by a vast number of rulings and court decisions—and while the law may have some defects, the tremendous development of the Mining Industry under its provisions proves it to be one of the best mining laws in the world, and

WHEREAS, any general revision would in all probability have as many, if not more, defects than existing law and would in addition, unsettle the great system of Mining Law which has grown up through so many years of experience and interpretation, and

WHEREAS, it would be easy to correct the defects in the existing law such as the extra-lateral rights provision by a simple amendment without disturbing the great body of the Mining Law which has worked so well.

NOW THEREFORE, it is the sense of your Committee that any general revision of the Metal Mining Laws at this time is unwise and inexpedient and be it resolved: that the Board of Directors of The American Mining Congress be instructed to appoint a committee to ascertain, as quickly as possible, the opinions of other mining men of the states affected by the proposed revision regarding the necessity for changing the present mining laws and the desirability of the changes embodied in H. R. 7736, and

BE IT FURTHER RESOLVED, that the Mining Congress use its efforts to further the desires of the majority of mining men of the states affected by the proposed revision as so ascertained.

I move the adoption of the resolution as reported by the Committee.

The motion was regularly seconded and carried.

Mr. Dick read Resolution No. 6, as amended by the Committee.

RESOLUTION NO. 6

Introduced by E. C. Stimson

WHEREAS, the discussions at this Convention particularly those of the National Tax Conference, have shown that there is a tendency in certain states to discriminate unfairly against mining properties and mining enterprises in matters of taxation and thereby curtail the mining industry and discourage the development of mines in many localities, and discouraging those who otherwise would take reasonable risks in developing the mining resources of the country.

BE IT RESOLVED, that the American Mining Congress protest against all such forms of taxation which directly or indirectly discriminate against mining property or mining enterprise and all forms of taxation which have for their purpose the object of obtaining any greater amount of revenue from mining property or mining operations than is obtained from other property, and

BE IT FURTHER RESOLVED, that the Tax Division of The American Mining Congress be authorized, upon request of any State Chapter, to provide a representative to appear before any board, commission or other legislative committee and to present information looking to the prevention of any such discriminatory or inequitable forms of taxation, and that the Tax Division be authorized to use all available facilities of this organization for this purpose and for the purpose of urging a campaign of education in matters of mine taxation.

MR. DICK: I move the adoption of the resolution as amended.

The motion was regularly seconded and carried.

Mr. Dick read resolution No. 8.

Upon motion duly made, seconded and carried, the resolution was adopted.

RESOLUTION No. 8

Introduced by A. G. McGregor

WHEREAS, during the period of inflation through which we have passed no difficulties were experienced in the adjustment of wages and commodity prices to the reduced purchasing power of our monetary unit, and

WHEREAS, during the period of deflation through which we are now passing business men hesitate to accept less dollars for commodities and the workers hesitate to accept less dollars for wages, and

WHEREAS, unless all commodity prices and all wages are kept closely adjusted to the increasing length of our yard stick of value, poor business, unemployment, and suffering are bound to result, and

WHEREAS, when our industrial machine is thrown out of adjustment the consequences may be serious if intelligence is not used, and

WHEREAS, the great good accomplished by education in safety first and in winning the war is realized by all, and

WHEREAS, while we can allow our economic illness to continue unabated, running its course with long after effects, it is time we were using intelligence and by a campaign of education and co-operation rid ourselves from its ravages.

NOW, THEREFORE BE IT RESOLVED, that The American Mining Congress in convention assembled does hereby endorse a program of sound business education with the end that labor will better understand the problems of capital and capital will better understand the problems of labor and thereby hasten a return to normal industrial activity upon which the employment and well being of all our people demand.

Mr. Dick read Resolution No. 9 and moved its adoption. The motion was seconded.

RESOLUTION No. 9

Introduced by Wm. J. Loring

WHEREAS, all commercial progress is based upon transportation, no commodity being of any value until it is removed from the place of its original location, and

WHEREAS, the transportation facilities furnished by the railroads of the United States have been a controlling factor in the development of our industries, and

WHEREAS, a large part of the costs of transportation as based upon the wages paid to the labor employed in its operation, and

WHEREAS, at the beginning of the war the wages paid to railroad operatives were equal to or above the average paid for similar service in other activities, and

WHEREAS, during the war the increasing cost of living made necessary increases in the wage scale to all labor, and particularly high increases were granted to railroad operatives, and

WHEREAS, because of this increased cost of operation the transportation rates of the railroads were of necessity increased in approximate proportion to the increase in wages, and

WHEREAS, the costs of living are gradually decreasing, and

WHEREAS, wages in other lines have been decreasing, and living costs to wage earners in other lines which have accepted reductions would be more nearly commensurate if costs of transportation could be reduced, and

WHEREAS, the last advance in wages granted by the railroads to their operatives was approximately 25 per cent, which increase in wage

resulted in an increase in freight rates of approximately 35 per cent; and

WHEREAS, the cost of living now is less than at the time when the wage scale was fixed, to which the 25 per cent increase was added, and, further, a reduction in freight rates would immediately reflect itself in a further reduction in living costs; and

WHEREAS, high freight rates furnish a continuing barrier to a return to normal conditions, which freight rates cannot be materially diminished so long as the present wage scale is in effect; therefore

BE IT RESOLVED, by The American Mining Congress in 24th Annual Session assembled at Chicago, Illinois, October 17-22, 1921, that we urge the railroads of the United States in conjunction with the Interstate Commerce Commission and the Railway Labor Board to immediately order that at some early date the last increase in freight rates will be abolished for the benefit of shippers, and that at the same time the last advance which was granted to the railroad operatives will be rescinded, and

BE IT FURTHER RESOLVED, that we pledge the endorsement and full support of the mining industry of the United States to the railroads in their effort to simultaneously reduce rates and wages to the level existing before the last increases were made.

Mr. Dick read Resolution No. 10 and moved its adoption. The motion was seconded and carried.

RESOLUTION No. 10

Introduced by the Tariff Conference

WHEREAS, the Congress of the United States is recognizing, in the Fordney Tariff Bill, the necessity for adequate protection for the products of American Mining Industries:

BE IT RESOLVED, that for the speedy resumption of industrial activity by employment of labor; for the realization of industrial independence in the development of our natural resources; for the establishment of the basic mineral industries of the United States on a permanent self sustaining foundation, and for the national security and defense, that those tariff schedules now proposed in the Fordney Tariff Bill, H. R. 7456, which offer adequate protection to American Mining Industries be sustained before the Senate Finance Committee. That the Senate Finance Committee be requested to give its consideration to the needs of those mineral industries for the products of which adequate provision for protection has not yet been made, and

BE IT FURTHER RESOLVED, that the speedy enactment of the proposed tariff legislation be urged upon the Congress of the United States.

Mr. Dick read Resolution No. 11 and moved its adoption. The motion was seconded and carried.

RESOLUTION NO. 11

Introduced by the Tariff Conference

Whereas, in order to provide tariff duties which shall adequately protect the industries to which the Mining Industry furnishes its products as basic materials, a method of valuation must be established which will prevent the dumping of undervalued foreign products in times of industrial depression.

BE IT RESOLVED, that the American Mining Congress endorses the broad principle of American valuation, and leaves to the wisdom of the Congressional Committees the determination of the administrative methods necessary for its proper application.

Mr. Dick read Resolution No. 12 and moved its adoption. The motion was seconded and carried.

WAR MINERALS RELIEF

RESOLUTION NO. 12

Introduced by the War Minerals Conference

WHEREAS, many producers of war minerals who suffered tremendous losses through their patriotic war time endeavors are still not recompensed as contemplated by the government under Section 5 of the Act of March 2, 1919.

BE IT RESOLVED, that The American Mining Congress heartily commends the attitude expressed in the letter of the Secretary of the Interior to the Committee of Mines and Mining, of the House of Representatives under date of June 2, 1921, in his evident desire expressed therein to achieve absolute justice and equity for all these claimants.

That the sympathetic consideration of the Mines Committees of the House of Representatives and of the Senate to secure adequate relief for these war mineral claimants be heartily commended and that the passage of the needful additional legislation to accomplish this purpose be given vigorous support.

Mr. Dick read Resolution No. 13, which, after amendment, was adopted.

RESOLUTION NO. 13

Introduced by the Arizona Delegation

WHEREAS, the prosperity and progress of the Western States of Wyoming, Colorado, Utah, Nevada, New Mexico, Arizona and California depend upon more irrigation and cheaper power. The industries principally concerned are agriculture, coal and metal mining and transportation. The prosperity of those areas already developed by irrigation is sufficient evidence of the wisdom and need of additional development. The coal and metal mining industry of this area is greater than that of any similar area in the world. Its welfare depends primarily on cheaper power and cheaper transportation, and

WHEREAS, the possibilities of development of both irrigation and power on the Colorado River in Arizona have long been known, but more particularly within recent years has their importance been called to the attention of the Federal Government through the investigation of the U. S. Reclamation Service of the Department of the Interior, ably seconded by the activities of the late Secretary of the Interior, the Honorable Franklin K. Lane and by his successor, the Honorable Albert B. Fall, and

WHEREAS, to secure maximum benefits from these resources no plan should be adopted which will not insure their comprehensive development, now therefore

BE IT RESOLVED, that The American Mining Congress in convention assembled October, 1921, hereby respectfully urges the Federal Government to proceed at once to complete whatever further investigations may be necessary for the undertaking of this great project, and to provide funds for the building of the first unit thereof.

Mr. Dick read Resolution No. 14 and moved its adoption. The motion was seconded and carried.

RESOLUTION NO. 14

From the Committee on Resolutions

WHEREAS, the American Mining Congress highly appreciate the honor and confidence manifested by the President of the United States in his letter directed to this convention asking that it give consideration to the working out and adoption of methods, which, will measurably regulate the demand for coal and make its mining and distribution more uniform over the whole year; and

WHEREAS, the Secretary of the Department of Commerce has by direct request asked this convention to appoint a committee representative of the whole mining industry to confer with him in the working out of plans and methods by which the Department of Commerce and other departments of the Government may be of greater service to the mining industry of the country, by assisting in putting into effect the most practical and beneficial methods in the production and distribution of our mineral products, and

WHEREAS, the conditions and proposals thus placed before this convention by the National Administration are of great national importance to all branches of the mining industry; therefore

BE IT RESOLVED, that in response to these requests, a committee be appointed of which the President and Secretary of The American Mining Congress shall be ex-officio members from the representative mineral producers of the United States to confer with the Secretary of Commerce and give all assistance possible in developing methods and plans of mineral production and distribution that will improve the conditions which now prevail and assist the Secretary of Commerce in his endeavor to render greater service to the mineral industry of the country.

Mr. Dick read Resolution No. 15 and moved its adoption. The motion was seconded and carried.

RESOLUTION NO. 15

Introduced by S. M. Evans

WHEREAS, the public interest will be served by conservation and the lowering of costs of the necessities of life and the requirements of commerce, and

WHEREAS, better co-operation between the producers and distributors of these necessary commodities will serve the public interest, and

WHEREAS, certain of our laws now prevent, or fail to provide for, such necessary and beneficent co-operation in such production and distribution of products in the public interest.

THEREFORE BE IT RESOLVED, that The American Mining Congress advocates such revision of the laws as will enable those engaged in mining and other industrial production and distribution to apply, in the conduct of all the great branches of our National industries, the necessary principles of conservation in production, economy in distribution, greater co-operation with labor and the consuming public, to the end that labor in the mining industry may be relieved of the burden of intermittency of operation, and the products of our mines and industries delivered to the ultimate consumer at the lowest possible price.

More specifically, we recommend that Congress so amend the Sherman Anti-Trust Act as to vest in miners, manufacturers, and distributors, the right to collect, collate, and distribute to themselves and to the public, statistics of their operations, thus relieving our mining and other industries from the necessity of operating in ignorance of existing stocks, current production, and current demand.

Mr. Dick read Resolution No. 16 and moved its adoption. The motion was seconded and carried.

RESOLUTION NO. 16

Introduced by the Committee on Resolutions

WHEREAS, the success of the twenty-fourth Annual Convention of The American Mining Congress held in Chicago, October 17-22, 1921, has been made possible by the cordial co-operation of the members of the Illinois Committee on Arrangements, the valuable assistance of the Chicago Association of Commerce and of the Illinois Manufacturers' Association; and

WHEREAS, the City of Chicago through its official representatives and in the courteous hospitality of its citizens has given to the delegates of the Mining Congress a real feeling of friendly welcome:

BE IT RESOLVED, that the officers and members of The American Mining Congress hereby express our deep appreciation of the co-operation given by the members of the Illinois Committee on Arrangements,

the members of the Exposition Committee, The Chicago Association of Commerce, The Illinois Manufacturers' Association; and especially we desire to express our appreciation of the work done by Francis S. Peabody, Chairman of the Illinois Committee on Arrangements, James H. Channon, Chairman of the Exposition Committee, and H. H. Merrick, Treasurer of this Committee.

President Loring took the chair.

MR. DICK: I don't believe I read No. 7, introduced by Falcon Joslin.

Mr. Dick read the resolution, together with the amendment offered by the Committee, and moved the adoption of the resolution as amended. The motion was seconded and carried.

RESOLUTION NO. 7

Introduced by Falcon Joslin

Whereas, the development of the great territory of Alaska is a subject of national importance, but a serious decline in the population of the territory is taking place, and

WHEREAS, the form of government of the territory with its administration distributed through a great number of bureaus, boards and commissions acting without co-ordination from Washington, 4,000 miles and more away, where the law-making power rests, has been mainly responsible for the ill-adapted and unworkable policies under which the territory is suffering.

NOW, THEREFORE BE IT RESOLVED, by The American Mining Congress in 24th Annual Convention assembled that it is the sense of this organization that the restrictive policies in effect in Alaska should be reversed and the resources there opened for development on the most liberal terms.

RESOLVED FURTHER, that it is the sense of this organization that the government of Alaska should be re-organized that its administration consolidated and placed within the territory and made directly responsible to the President.

Mr. Dick read Resolution No. 17 and moved its adoption. The motion was seconded and carried.

RESOLUTION NO. 17

Introduced by the Committee on Resolutions

RESOLVED, by The American Mining Congress in Twenty-fourth Annual Convention assembled in Chicago October 17-22, 1921, that it is the opinion of the officers and members of this Association that the publicity received during the meeting has been constructive in nature and of great value to the mining industry and to the business of the country generally;

RESOLVED FURTHER, that we express our deep appreciation for the co-operation given to this end by

The Associated Press
City News Bureau
International News Service
United Press Association
Journal of Commerce
Chicago Herald & Examiner
The Daily News
The Chicago Journal
The Chicago Evening Post
The Chicago American

CHAIRMAN LORING: This concludes the deliberations of the Congress on the report of the Committee. Is there anything further to come up before we adjourn?

SECRETARY CALLBREATH: Mr. Chairman, there is one resolution of thanks which ought to have been prepared. The exhibitors at the Exposition have made it possible to accomplish what has been done here. We hope and believe that they have been benefited by their contributions, but we are always grateful to those who co-operate with us, even though they may get a hundred dollars back for each dollar they contribute. I think that is about the ratio of the benefit to the mining industry for the contributions to the American Mining Congress.

A few days ago the United States Senate had introduced before it by a senator a bill providing for the abolition of the depletion and the discovery clauses in the income tax bill. He said that because of those provisions, $2,400,000,000 of taxable income had escaped the treasury department. I have a statement showing the average rate which was intended to be made to apply in the development of that law, which was that incomes should be taxed at a rate of 33⅓ per cent. The coal industry has paid 42 per cent of its total net income to the government; the metal industry, including iron, gold, silver, copper, has paid 22 per cent of its income to the Federal Government. Agriculture has paid 24 per cent to the Federal Government. I forget the exact amount of the miscellaneous items.

If the senator was right in his statement that the depletion clause has enabled $2,400,000,000 to escape the treasury and if thirty-three and a third is the average between twenty-two of the metal and the forty-two of the coal, then the American Mining Congress' effort in securing the adoption of the depletion

and discovery clauses of the revenue bill has saved one-third of $2,400,000,000, or $800,000,000 per year since the enactment of the income tax law of the Federal Government.

I will say that the Senator was mistaken because he included in that depreciation of manufacturing plants, but there is no question in my mind but that the depletion and discovery clauses of the bill have prevented the mining industry from being separated from taxation upon their capital and not their income to the extent of at least $150,000,000 yearly.

The American Congress has had $150,000—the total amount to spend, a large percentage of which was spent for printing journals. So that $150,000 expense, as compared with $150,000,000 saving to the mining industry, is the ratio in which the mining industry profits by its contributions to our work.

We have done many other things besides our efforts on taxation. I feel, however, that notwithstanding my hope that the exhibitors came out well, (and I understand they are all well pleased, or practically all well pleased, and delighted with the show) they are entitled to our thanks and appreciation as we appreciate all assistance that comes to us. While the manufacturers of mining machinery are rather closely associated with us, and while we need their help in the development of those mechanical contrivances by which efficiency of production is made to apply in the mining industry, yet we are very grateful to them. I move you, Mr. President, that a rising vote of thanks be extended to them; or perhaps I had better say that the officers shall be requested to prepare a suitable statement of thanks and appreciation to be extended to the contributors and cooperations and exhibitors who have made this exposition possible.

MR. STEELE: I would like to make a motion, if I am in order, that the Secretary of the American Mining Congress be instructed to prepare a resolution which he in his best judgment may deem wise, covering the points so expressed in his talk, and the same be spread upon the records and published in the annual proceedings of this Convention.

SECRETARY CALLBREATH: I will withdraw my motion in favor of that.

Mr. Steele's motion was duly seconded and carried.

CHAIRMAN LORING: If there is nothing further to be brought up now, I have something to say which will conclude

the meeting. I intended to say this last night at the banquet, but owing to the long speeches that we were pleased to listen to, I was deprived of the pleasure of saying what I am now going to say.

I want to tell you how pleasant it has been for me to work during the past year for the Mining Congress, for its members and for the upbuilding of the Mining Fraternity, the Mining Industry, and everything pertaining to it. It has been made easy on account of the admirable staff headed by my friend Mr. Callbreath in Washington. Without Mr. Callbreath's aid at the head of the Mining Congress, and his staff of able assistants, I would have had a jolly bad time of it, so that any success that has been made in the past year has been due to him and not to me. I just want that to go down as a matter of record because it comes from the bottom of my heart, and I expect next year to do everything I possibly can to assist him, his staff and our Mining Industry.

As a slight token of appreciation to Mr. Callbreath and the high esteem in which I hold him, I am going to present to him this little token of respect which I hope he will use and accept in the same spirit in which it is given. (Applause.)

President Loring presented Secretary Callbreath with a gold pen and pencil.

This terminates the proceedings for this year, and the meeting will stand adjourned until a date to be fixed next year at a place not yet decided.

The meeting adjourned sine die at eleven-thirty.

(The following addresses were not delivered at the convention, but were ordered incorporated in the proceedings.)

THE ESSENTIALS OF AN AMERICAN FOREIGN MINERAL POLICY

By C. K. Leith

Most people will agree that nations should not fight, and that causes of war should be investigated and eliminated as far as possible. At the same time, if we are patriotic citizens, we feel the urge to protect and advance the welfare of our nation against the world—a feeling reinforced by a natural and instinc-

tive regard for our personal interests. Unfortunately, as the world is constituted, it is not possible to realize both of these ideals at the same time. We cannot have universal peace and good will, if we insist on gratifying every national and personal ambition, even if these in themselves are legitimate and justifiable. There is too much overlapping. World peace to most of us is still a theoretical abstraction—to be thrown aside when it comes in conflict with the serious business of getting ahead in life, nationally or personally. "World peace—yes—but give us what we want, regardless." It is a curious fact that advocates of peace are often the same people who are urging some special interest adversely affecting other countries, apparently without recognition of the possible contradictions involved.

One of the most prolific sources of international discord lies in the control of mineral resources. The world has used more of its mineral resources since 1900 than in all preceding history, and the time has gone by when this use can be treated as an incidental matter. It is one of vital concern to all nations. No one country can monopolize any disproportional part of the world's available minerals, or attempt to, and at the same time preserve friendly relations with others. It is futile to talk world peace or limitation of armaments unless we are willing to understand and act on mutual restrictions of national rights in this field.

The interests and ambitions of the different parts of the mineral industry in foreign matters are so extremely diverse and each of them is urged so vigorously by the people most concerned, that it is difficult to discern what, if any, are the underlying aims and principles of the industry as a whole. The industry itself is presumably better qualified to speak on these matters than others, and yet to the public its representations must sound like a babel of special interests.

Any proposed general platform is likely to undergo many vicissitudes before substantial agreement is reached, but this is all the more reason why at least a start should be made. In recent months a number of men connected in business and professional ways with the mining industry have been attempting to agree among themselves about the essentials of such a general policy, and I will present a few of the ideas which have been evolved though without committing others to the exact form of

expression I shall use. This is done to invite discussion and criticism, in the hope that the American mining industry may come nearer to agreement on these fundamental matters, not only for its own guidance, but for the needed and welcomed guidance of our officials, who are sorely pressed in their attempt to get unbiased aid in the settlement of the many vexing international problems relating to minerals which are now before them. Emphasis is placed on elementary considerations of fact, which are believed to be basic to the formulation of laws and agreements affecting natural resources, rather than on a discussion of specific measures.

Mineral resources are wasting assets fixed geographically by nature, and change in this geographic distribution is not within our power. Some kinds of minerals are so widely distributed that nearly all countries have adequate supplies within their own boundaries or near at hand. Other minerals are so distributed that some parts of the world have a surplus and others a deficiency. No country is entirely self-sufficing in regard to either supplies or markets for all mineral commodities; in every country certain minerals are available in excess for export and others are deficient and must be imported, either in crude or manufactured forms. International exchange of minerals cannot be avoided if all parts of the world are to be supplied with needed materials.

The general nature and location of the fixed channels of international mineral exchange are not matters of conjecture; they are capable of reasonably definite statement.

The necessary international movements of minerals may be aided or hindered by bonuses, preferential duties, tariffs and embargoes. Those measures may be locally and temporarily desirable for a great variety of reasons, but in general it is our belief that measures of this kind aimed at the essential closing or diversion of the main international channels determined by nature are doomed in the long run to failure, and the effort to apply them will cause much unnecessary friction and readjustment in the orderly development of the mineral industry and in international relations. When, for instance, it is proposed by tariff to foster an infant mineral industry, the geologic facts of the situation should be squarely faced to make sure that these controlling facts make such a course possible, otherwise there

may be vast and useless expenditure of human energy in attempting to develop certain kinds of mineral resources in parts of the world where they are not present in sufficient abundance to be worthy of development. Mineral resources cannot be created by legislation.

Just as it is futile to attempt to make each state in the union self-supporting in regard to all minerals so the effort to make each country independent of others is rendered impossible by the fact that nature has not distributed her resources in this fashion. Specialization of effort on particular minerals for particular localities seems essential to the conservation of human energy and the most efficient utilization of nature's resources. To illustrate, if the distribution of raw materials is such that the United States can specialize on the production and export of copper, iron and steel, and can do this with high efficiency, it seems hardly desirable that it should devote any large amount of effort to the development of its entirely adequate tin and nickel supplies, which other parts of the world can more efficiently produce.

There are minerals which are so distributed that the necessity of international movement is not so apparent. For such minerals there may be reasons of other kinds for aiding or restricting this movement.

Concentration, refining and fabrication of mineral materials near sources of supply of the raw materials are to be encouraged where conditions allow it, in the interest of reduction of bulk and more efficient transportation. Countries fortunate enough to possess large supplies of a needed mineral, deficient elsewhere in the world, are entitled to advantages that may come from conversion and fabrication of raw materials, unless local conditions make this possible only at excessive cost. Coal is the chief energy resource required for this work, and experience has shown that many minerals can be utilized with greater efficiency near sources of coal than near the sources of the minerals. With this consideration in mind, we do not favor the application of government measures of aid or restriction which attempt to establish a local smelting or fabricating industry where the supplies of raw materials, including coal, are such that the cost is excessive and efficiency low as compared with more favored localities.

We recognize as a qualifying factor the conditions of shipping which sometimes make it cheap and efficient to carry crude ores as a means of securing proper combination cargoes and as a means of balancing local import and export requirements.

Exploration and development of mineral resources are continuously necessary to replenish ore reserves depleted by production. The world has used more mineral resources in the present century than in all preceding history, and the per capita consumption of minerals in the United States has multiplied ten times in forty years. The problem of freedom of replenishment is not incidental, but of basic importance to the prosperity of the greatly magnified industry which can be easily foreseen for the future. Any restrictions, national or international, which interfere with this necessary searching of the earth are in principle undesirable. We recognize the necessity and economic justification, during the early exploration stage and particularly in the case of petroleum, of rights covering large areas in order to induce and justify the expenditures necessary for careful exploration work in new regions. Where such concessions are safeguarded by the stipulation that within a limited period of, say three to five years, the holder must select for retention a small percentage of the original exploration area, the result is development without exclusion. Exclusive concessions on large areas without such a reduction factor are economically unsound.

It is believed that the aid and supervision of governments may be desirable in connection with exploration work, so far as they do not destroy the opportunity for private effort, but it is further believed that government agencies cannot be substituted in this field for private initiative, except at the expense of elasticity and variety of attack essential to the adequate meeting of the complex problems of mineral development and especially of mineral discovery.

In regard to this necessary activity of exploration we stand for equal opportunity and the open door, national and international. Equal opportunity and open door are considered as implying, among other things:

(a) That there be no restriction on the transfer of mining concessions to Americans, for example, or to foreign companies controlled by Americans.

(b) That there be no restriction placed on the nationality of the shareholders, directors or managers in companies holding mining rights and concessions, allowing thereby the free purchase and acquisition of such by individuals of any nationality.

Where backward countries possess important mineral supplies needed by the world we can see no escape from the conclusion, whatever the ethical merits of the case, that demand will make itself felt through political pressure of other countries. In such cases we favor joint action by governments to secure equal opportunities for all nationals. If circumstances require that pressure be brought by one government, the end to be sought should be the opening up of territory to all nationals, and not for the exclusive benefit of the government bringing the pressure. Disregard of this principle has been the cause of much international friction.

To accomplish the purpose outlined in preceding paragraphs, it is urged that the United States Government should maintain closer touch than heretofore with American activities in foreign mineral fields. This might well be accomplished by using mineral specialists as diplomatic attaches, consular agents or agents of the Department of Commerce, in countries where mineral raw materials play a large part in our international relations. There should be more systematic reports to the home government, and more attention on the part of the home government to the interpretation and correlation of this information, with the purpose of determining which of our foreign activities in minerals are essential for our national welfare, and of accurately determining the force and practical application of the mining laws of such countries, and advising American companies and protecting their operations thereunder. Such information should be at the disposal of such of the citizens as are interested in mining developments. In short, intelligent co-ordination and supervision of the problem of foreign mineral materials by qualified and responsible officials of the home government we believe would be greatly to our own self-interest, and at the same time eliminate needless causes of international discord. Other governments have made significant starts in this type of administration.

In cases of international dispute, and there are many such relating to minerals, we further suggest the desirability of utiliz-

ing international fact-finding committees to ascertain and present the essential facts, as a basis for international negotiation. For instance, some of the recent diplomatic discussion in relation to exploitation of oil in foreign countries has been unnecessarily complicated by differences in statement of fundamental geologic facts of distribution, which might easily be eliminated by an international conference of qualified experts.

In the application of the above general principles to the mineral resource situation in the United States we present the following basic considerations:

The United States has been endowed with mineral resources to an extent not surpassed by any other country. It is utilizing these resources so fully that its annual mineral production is nearly two-fifths of that of the globe. Exploration will undoubtedly disclose further large reserves, but the geologic conditions are sufficiently well known to warrant the belief that the salient features of mineral reserves in the United States can be outlined for the future. The following tentative classification of mineral supplies is based mainly on data gathered by various government bureaus during and since the war. In the nature of the case it will be difficult to secure general agreement to every item, and modifications are inevitable, but I believe it to approximate the true situation in its main outlines.

It is clear that the United States has, and will continue to have, a valuable exportable surplus of copper, coal, iron and steel, phosphates, silver and sulphur.

So far as available quantity is concerned there is no reason why these minerals should not be exported. Prosperity of the industry may depend largely on maintaining foreign outlets, in which case these should not be closed by restrictions requiring local conversion and fabrication where this means excessive cost, or by import taxes inviting retaliation on minerals of which our own supply is deficient. For instance, export of coal from the United States is a natural consequence of our large supplies, the needs of other countries, and our ability to produce more efficiently and cheaply than certain other coal-exporting nations, particularly England. We are in a position to do the world an efficient service. We also help ourselves by supplying an equalizing and stabilizing factor to an industry handicapped by such seasonal demand that the average coal mine is idle

over a third of the year. We more fully utilize our capacity for production. Without increase of imports there is little room for further development of coal export trade without unbalancing the ratio between imports and exports.

The supplies of many important minerals in the United States approximately balance domestic requirements without considerable exportable surplus. Small amounts of these minerals have been and will continue to be exported because of special grades or backhaul and have been and doubtless will continue to be imported because of the same reason, or because of cheaper sources of foreign supply. Such imports are not, however, for the most part, essential as a source of supply. This list includes aluminum and bauxite, arsenic, artificial abrasives and emery (except Naxos emery), asphalt and bitumen, barite, bismuth, borax, bromine, building stone (except Italian marble), common stone, sand and gravel, cadmium, Feldspar, fluorspar, fuller's earth, gold, gypsum, lead, lime, magnesite, mineral paints (except umber, sienna, and ocher from France and Spain), molybdenum, oil, pyrite, salt (except special classes), talc, titanium, tripoli and diatomaceous earth, and zinc.

For minerals of this group the domestic supplies are such that they do not constitute compelling reasons for opening or closing channels of international movement. There may or may not be reasons of other kinds, but it is our purpose here only to indicate the effect of known supplies on the question of international movements of minerals.

The inclusion of oil among the minerals of Class B, in which the country is approximately self-supporting, requires some explanation and qualification. The United States leads the world in its oil production, but it also leads the world in consumption. If our exportation of refined products were eliminated we could probably get along for some time on the domestic production. As it is, imports from other countries, particularly Mexico, have been necessary in recent years to balance the export of refined products. The industry is on a very efficient basis and the United States is able to perform a service to the rest of the world in gathering and distributing this material. It seems desirable, in the interest of our continued service to the world, that channels of import and export be kept open. Looking forward to the future, it is doubtful whether the domestic produc-

tion will long keep up with domestic demand, which is an additional reason why channels of import should be maintained.

In the exploration and development of oil, American initiative and capital have proved most efficient and should be allowed the fullest latitude both at home and abroad, with the purpose of insuring adequate supplies for future home consumption and supplies for refinement and export to the rest of the world. The government can aid in securing and preserving this opportunity.

Self-interest plays so large a part in asking these opportunities for ourselves that we deplore criticism toward other countries for asking the same themselves, so far as their activities do not impair a fair field for private initiative and competition.

The United States will be dependent on foreign sources for a considerable fraction of its supply of antimony, asbestos, ball clay and kaolin, chalk, chromite, corundum, garnet, certain grades of graphite, grinding pebbles, manganese, mercury, mica, monazite, Naxos emery, nitrates, potash, precious stones, pumice, tungsten, vanadium, and zirconium.

The United States will in the future, as in the past, depend on other countries almost entirely for its nickel, cobalt, platinum, tin, gem diamonds, black diamonds, or "carbonado," and diamond dust and bort.

Future exploration may disclose adequate supplies of some of these minerals in the United States, but for the most part we believe that the geologic conditions are sufficiently well known to make this outcome unlikely. With certain exceptions noted below, we believe that any attempt by legislation to keep foreign supplies out and to make domestic supplies of these minerals suffice for United States needs will not succeed except at excessive cost in efficiency and money. Such a course also would mean depletion of limited supplies which may seriously endanger the country in a time of great future need. In the meantime governmental restrictions on imports (probably with retaliatory measures abroad) are likely to make it more difficult for American enterprise to find and develop needed resources of those minerals in foreign countries where the geologic conditions are more favorable.

This statement of principle emphasizes nature's distribution of minerals as a basic factor in determining the international

movements of minerals. It does not attempt to cover all the qualifying economic factors in the situation.

These considerations are presented from the point of view primarily of the broad self-interest of the mineral industry of the United States, but they are also vital to the preservation of friendly international relations. We are confident that a common understanding of these elementary facts of geographic distribution of minerals, and of the consequent necessary mineral movements determined by nature, is an important first step in minimizing international difficulties.

FUTURE ELECTRIFICATION IN THE DEVELOPMENT OF THE MINING INDUSTRIES

By GIRARD B. ROSENBLATT AND GRAHAM BRIGHT

The subject that interests the mining industry most fundamentally is money. The future of electrical power in the development of mining depends upon what it means in terms of money.

It is our intent to outline briefly some ideas regarding the influence of electrification upon the cheapening of mining costs. We will endeavor to point out along what lines such development may logically be expected, and what may be anticipated during the next decade in the way of electric power supply for mining and metallurgical operations.

Further electrification of the mining industry will most logically be along three lines, namely:

(a) The displacement of manual labor.
(b) The supplanting of present steam drive by electric power.
(c) The development of new metallurgical processes.

(a) Electric power will replace manual labor more and more as the supply of cheap labor continues to decrease, and as the laboring man develops an objection to monotonous occupation, which objection is always incident to an improvement in the standard of living. Mining and metallurgical operations consist largely of moving and treating material in bulk. Man power, except in very special and specific instances, is not a cheap way to move bulk material. Electric power is the most logical sub-

stitute because of the flexibility of its application, the economies that may be affected by its use, and its reliability when properly installed. Already the electric locomotive in the smaller sizes has largely displaced hand-tramming, mechanical shoveling machines are replacing the mucker underground, while scoop loaders, bucket elevators and belt conveyors continue to replace shovels operated by strong backs and weak heads. Further developments in the replacement of manual effort by electric power will most probably depend in part upon a realization of what can be saved by displacing human labor, and upon development of equipment and machinery that will be more flexible than present apparatus, that can be operated more accurately to stimulate the action of an efficient man, and that can be economically purchased in units small enough to displace a small group of men in handling restricted tonnages. The advantages of mechanical handling today are generally realized when large tonnages are considered. Further progress will come through the perfection of equipment to displace manual labor in the handling of smaller tonnages, and the education of the public towards realizing the advantages of such equipment.

(b) Electric power will supplant steam power as hydro-electric energy distributed by public service corporations becomes more generally available, and as methods of electric generation become continuously more efficient. Already we see the networks of the big central station organizations of the country spreading out over the mountains to localities where basic raw materials are being produced. Where such central station power is available electrification will be rapid. Where central station power is not available, as in some of our desert regions, increased electrification will depend upon the obvious economies of generating electricity in bulk and applying it in parcels to the performance of mechanical operations. Electricity as a power for hoisting, pumping, ventilating, air compression, transportation, and milling, is inherently more economical than steam under a majority of conditions, because of the high efficiency of electrical equipment, the convenience of its use, its low maintenance charges, and its operating simplicity. The increased use of electricity in performing those operations now very commonly performed directly by steam depends upon the education of the using public to properly view their power problems as an

entity, and not to base decision only upon a comparison of tabulated efficiencies of individual equipment.

(c) One of the greatest opportunities for the lowering of metallurgical costs lies in the commercial development of processes using electric power directly for the production of thermal effects, and for electrolytic action. Electric furnaces have come to stay in the production of ferro alloys. Eventually it is to be expected that electric smelting of certain of the base metals may be feasible and economical. Such smelting would permit operating many isolated properties at a decided advantage. In the meantime great strides are being made in direct precipitation of pure metal from liquors produced by the direct leaching of mine ores, such as the production of copper at the plant of the New Cornelia Copper Company at Ajo, and of zinc at the plant of the Anaconda Copper Mining Co., and elsewhere.

Experiments that have been conducted in the direct production of what in the past have been considered fabricated articles, like sheet copper, have been most encouraging, and I believe that in the not far distant future we may expect to see material that has always been considered as of secondary manufacture, produced directly by electrolytic action in the leaching liquors resulting from the direct treatment of ore.

In the final analysis, the further utilization of electric power in the mining and metallurgical industry will depend upon the answer to the question: Does it pay? To obtain a true answer to this question it is necessary that we consider the entire problem presented in connection with any given application. It is not sufficient, nor proper, to examine and compare the first costs and efficiencies of electric power with some other method of performing a desired operation. The proper way to study the problem is to consider all of the factors that may affect results, and then to determine comparative costs in the terms of units of production and dollars of expenditure. In mining and metallurgy this almost invariably resolves itself into costs expressed in CENTS PER TON.

A fair examination of each mine's individual problem will frequently show that electrification offers a true saving in tonnage costs. Reduced tonnage costs means a great profit on ore mined, and the extension of ore reserves because lower grades

can be worked within the limit of permissible cost. This is the basic reason that further utilization of electric power is assured in the development of the mining industries.

In considering the relative costs of electric power and other forms of power supply, it is not proper to consider the unit cost of power purchased or generated. Rather should we look to the unit cost of power involved in the results accomplished. For instance, in considering the cost of hoisting with steam generated locally as against the cost of hoisting with purchased electric power, it is not proper to compare the pounds of steam used by the steam engine with the KwHrs. of electric power purchased for the electric hoist. Other factors enter into the problem. There are the standby losses for the steam plant when the hoist is not in operation. There are the maintenance costs of the entire steam plant from coal pile to crank pin, to be balanced against the maintenance of the electrical drive. Further, there is the matter of considering whether the flexibility of the electric hoist may not permit a more economical hoisting schedule than would be used with a steam plant that cannot be left idle without incurring a loss. What the mine operator really wants to know is whether the steam hoist or the electric hoist will mean a greater charge per ton for ore brought to the surface, and no factor that enters into this cost should be overlooked in making a fair comparison. The unit cost of power is only one of the factors that enter into the total which must be considered.

There are three lines along which proper study may aid the mine operator to reduce his cost per ton mined by the proper utilization of electric power.

The first is the proper selection of apparatus to do the work that must be done.

The second is the proper scheduling of operations in order to use the power purchased or generated to best advantage.

The third is the possibility of reducing the unit cost of power.

The proper selection of electrical apparatus reduces power consumption per unit of work accomplished, eliminates interruptions in operations, and decreases the item of labor required for

attention to the process and for the maintenance of the equipment.

Experience is one of the best guides in the selection of the best equipment to do particular work, but past experience of others should not be followed too blindly. The art of producing electrical apparatus is advancing—and advancing fast. Holding to past practice, however successful it may have been under conditions that are also past, is frequently a stumbling block in the road of progress. The best guide to the proper selection of electrical apparatus is advancing—and advancing fast. Holding to understanding of the fundamental characteristics of electrical apparatus, backed by extensive experience in its application. Today the larger electrical manufacturers are all prepared to furnish such engineering guidance to the mine operator.

The use of synchronous motors in and about mines and milling plants offer a fruitful field for the reduction of costs by the proper selection of apparatus. A few years ago the synchronous motor was considered a rather unreliable and complicated piece of apparatus. Until comparatively recently this reputation was probably justified. Today the design of synchronous machinery is sufficiently well understood that synchronous motors can very advantageously be applied to many drives that have in the past been cared for entirely by induction motors. The synchronous motor of today can be produced with characteristics to meet the requirements of a large variety of loads all the way from pumping and air compression up to crushing and mill drive. In its modern form it is a machine easy to operate and control, and it has very decided advantages for many applications. For very high speeds and for low speeds it is frequently cheaper to buy, and in almost all cases it has better efficiency than corresponding induction motors. Its use permits the improvement in power factor in return for which many power companies are willing to make concessions. Its power factor corrective capabilities are of further interest to the mining company in that proper installation of synchronous motors reduces losses in their distribution systems, increase the effective capacity of their transformer stations, and improves the regulation of their plant power supply. The importance of the synchronous motor to the widespread distribution of electric power over long distances, with a

resultant economy that must eventually be reflected in lower power rates, has been very capably placed before the engineering profession by Mr. F. G. Baum in his paper before the American Institute of Electrical Engineers at the convention held in Salt Lake City, June, 1921.

The developments of automatic and semi-automatic control of electrical equipment has made great progress in the past few years, and it may be expected that the further use of electric power in mining enterprises will take full advantage of such control systems now available. Automatic and semi-automatic control allows large savings in tonnage costs by reducing the number of operators required, by permitting equipment to be operated by less skilled labor, and by reducing power consumption. Automatically controlled substations are now in use on the haulage systems of some of the larger coal mines. Semi-automatic battery charging systems are used quite extensively in connection with storage battery locomotives. Semi-automatic hoisting has been in successful use at Inspiration for several years. The Phelps-Dodge Corporation have just installed semi-automatic control on the motors throughout the new concentrator of the Copper Queen at Bisbee.

Proper scheduling of operations reduces tonnage costs by getting the greatest amount of work done for a minimum expenditure in dollars for power. Such scheduling depends upon the conditions under which power is generated, or upon the terms under which it is purchased. Frequently a great saving can be accomplished by the elimination of peak demands that might be occasioned through the concentrated or simultaneous performance of operations, which by proper scheduling could be arranged to succeed one another so that their power demands would not be coincident. Much good work along these lines has been done by some of the larger mining companies.

As an example of practice in the scheduling of operations to reduce peak power demands, many properties do their coarse crushing in one shift per day, choosing that shift when their other operations require a minimum of power supply. Such practice, of course, means adequate storage capacity between the coarse crushing and the subsequent milling operations. The investment in such storage capacity frequently shows an excel-

lent return due to the saving in operating charges accomplished by reducing peak power demand.

Another instance not infrequently met, is the charging of storage battery locomotives during the "off" shift.

Other opportunities for scheduling operations around the mine and mill so as to reduce peak power demands often exist. For example, it is sometimes feasible to arrange for hoisting ore during periods when the power requirements for other operations are at a minimum. Very frequently peak power demands may be reduced by slowing the speed of hoisting so that the maximum demand for hoisting power is kept low. Reducing the speed of hoisting naturally lengthens the period required to hoist a given tonnage of ore. Often it is economical in cost per ton of ore hoisted, to do this rather than to try to get all of the tonnage out in a minimum length of time.

Some of the larger mining properties in this country have extensive interests which consume a large portion of the power output of the hydroelectric systems supplying the districts in which they are located. The thought is suggested that some of these large organizations could economically install a system of load dispatching so that the daily power requirements of their various interests could be balanced without interfering with production, yet in such a manner that their total requirements could be met with a smaller investment by the public service corporations to such an extent that more attractive power rates could be allowed.

Of the possibilities for reducing the unit cost of power, more will be said later.

Where hydroelectric or other forms of central station power are available, electricity is in quite common use for pumping, air compression, hoisting, and milling operations. Even in such localities however individual steam plants, particularly for hoisting, are not altogether unusual. Rare indeed is the mining camp that does not exhibit one or more mines that at least do their hoisting with steam power despite the fact that cheap electric power is available. Frequently these steam plants are retained largely through prejudice against electric power and the fallacious opinion that steam hoists are more reliable. An unprejudiced analysis almost invariably shows that the reliability of electric hoisting is superior to that of any isolated steam plant,

and that the possible saving due to electrification would quickly pay off the investment required to permit the displacement of steam power with electric power.

The rapid progress that is being made in perfecting mechanical shoveling machines, haulage equipment for small tonnages, car loaders, car dumpers, and excavating equipment, offer a big field for the further electrification of mining apparatus with consequent decrease in tonnage costs. The authors expect big developments along these lines within the next decade. Other developments that will tend towards further electrification even though such applications are small consumers of power, include the perfection of portable electric miners' lamps, shot firing by electric means, and radio communication between headquarters and remote properties.

In addition to the savings in tonnage costs that may be made by the proper selection and application of electrical apparatus, and by the proper scheduling of operations to get the most out of every dollar's worth of power used, there is reason to believe that in the future further savings in the use of electricity may result from a lessened cost per unit of power. The hope for such reduction in cost per KwHr. or H. P. year lies not so much in the increased electrical efficiency of generating or transmission equipment as in the more economical generation and delivery of electrical energy through the adoption of what has been termed the Super-Power idea.

The idea of a Super-Power system was conceived by Mr. W. S. Murray with the particular idea of reducing fuel consumption and increasing the reliability of electric power in the northeastern portion of the United States at a time when both these matters were of extreme importance to the continued economical welfare of the nation. However, the idea is not alone applicable to that particular territory, and in a modified way it can be well applied to the western regions fed in the main by hydroelectric systems which operate fuel burning plants only as auxiliaries.

Essentially the idea of Super-Power involves an interconnection of existing power systems in such a way that the power supply of a large territory, covering possibly a considerable number of states, may be obtained from a general transmission system into which all of the various power systems feed their input. The general transmission system acts as a sort of equalizing

reservoir, much as does the receiver in a mine air compressor system.

The particular advantages to be gained by such wholesale operation include the following:

(1) The very large diversity factor in the loading of such a system will permit operating all generating equipment and all trunk line transmission busses at very high load factor with consequent economy.

(2) The production of power can be cared for in efficient large units, and the wasteful small plant operating at poor load factor can be discarded.

(3) A unionized system of this character can take full advantage of the maximum run-off in various streams used for power development because, due to geographic and climatic differences, the period of high water will not be coincident in all streams feeding the system.

(4) It would be possible to develop on a profitable basis certain hydroelectric power sites which hitherto had been uneconomical due to their distance from the load center even though the unit cost of development at such sites was low.

(5) Power supply from such a system would be practically free from any interruptions and continuity of service would be effectively perfect.

(6) The same investment in costly transmission lines would serve in whole or in part a number of generating systems with the consequent distribution of overhead costs over tremendous amounts of delivered power, thus reducing the fixed charge to be carried by each unit of power used by the consumer.

The Super-Power idea really offers the possibility of materially decreasing the unit cost of power through the savings, both physical and financial, that its adoption would permit. Our large public service organizations in the West recognize all of the basic principles involved in the idea, and incorporate them in their individual engineering and operations. Mr. Murray's idea is simply an extension of approved practice to a scale that would permit further economies for the benefit of both the users and producers of power, and for the conservation of our national resources.

Under the conditions that maintain in the western mining regions the Super-Power problem is largely one of economical long distance transmission of electric power. The solution of this phase of the problem is one in which the consumer, as well as the producer, must play his part. As pointed out by Mr. Baum in his excellent presentation referred to above, the addition of synchronous motor load materially reduces the difficulties of long distance high voltage transmission, which gives us another angle from which to view the advantages to be derived from the proper selection of electrical apparatus to assist in reducing the future tonnage costs in mining.

In closing it may perhaps be of interest to present to you some data as to the interdependence of the electrical industry and the mining industry. You may be interested to know to what extent the mining industry is at present a user of electric power, and to what extent the electrical industry is a user of mine products.

During the year 1920 the power generated in the western states, which embrace the region in which are located a large proportion of the mines of this country, there was generated a total of approximately eight billion kilowatt hours of electrical energy. Of this total about six and a third billion was generated by public service corporations and sold. The electric power used by the mining industry amounted to about one and a quarter billion kilowatt hours, or roughly 20% of all the power sold by the public service corporations.

During the same year 1920 one of the two largest electrical manufacturers in this country built about two and three-quarter million kilowatts of electric power equipment, and to construct this equipment they used practically forty million pounds of copper, eight hundred and fifty thousand pounds of zinc, three-quarters of a million pounds of lead, three hundred thousand pounds of asbestos, and six hundred and fifty thousand pounds of mica.

These figures will give you some idea of the importance of these industries each to the other, which importance will be still more magnified through the growth of the mining industry that will be permitted by further electrical developments, and further use of electric power in mining and metallurgical operations.

ANNUAL MEETING OF MEMBERS

A meeting of the members of The American Mining Congress was held at Room A-20, Congress Hotel, Chicago, on Wednesday, October 19, 1921, at 7:30 p. m. The meeting was called to order by the President, Mr. W. J. Loring. The Secretary announced that a quorum of the membership was present in person or by written proxy.

The following committee on nominations was unanimously elected:

Mr. Falcon Joslin,
Mr. J. C. Dick,
Mr. Chas. W. Potts.

On account of the Smoker, further business was deferred until the adjourned meeting. The meeting adjourned to meet at Room 1124, Congress Hotel, Friday morning, October 21, 1921, at 9:00 o'clock.

Friday, November 21, 1921
9:00 A. M.

Meeting of members reassembled at Room 1124, Congress Hotel. Called to order by President W. J. Loring. The financial report of the Secretary and the report of the auditor were presented and upon motion duly seconded, the report was unanimously approved.

While waiting for the report of the nominating committee general discussion was participated in by various members expressing general satisfaction in the work of the organization and the success of the convention.

The report of the nominating committee was presented by Mr. Joslin as follows:

To the American Mining Congress: Gentlemen: The undersigned nominating committee beg to report and respectfully recommend the following names for filling the office of Directors of the American Mining Congress for the ensuing three years:

Bulkeley Wells, Denver, Colorado; E. L. Doheny, Los Angeles, Calif.; Sidney J. Jennings, New York; H. W. Seaman, Chicago, Illinois.

Respectfully submitted,

Falcon Joslin,
J. C. Dick,
Chas. W. Potts.

Upon motion duly seconded it was ordered that the Secretary cast the unanimous ballot of the organization in accordance with the report of the nominating committee, which being duly done, the President declared the election of Bulkeley Wells, E. L. Doheny, H. W. Seaman, Sidney J. Jennings as directors of the American Mining Congress for a term of three years and until their successors shall be duly elected and qualified.

Upon motion the meeting adjourned.

National Conference Coal Operators

OCTOBER 18, 1921

The meeting was called to order at 3 o'clock p. m., in the convention hall of the Coliseum by Secretary Callbreath.

SECRETARY CALLBREATH: Ladies and gentlemen, will you kindly come to order.

The chairman who was selected for this afternoon's meeting has found it impossible to be here, and I take pleasure in introducing to you one of the newer coal men of Chicago who gives promise of being one of the bigger coal men of Chicago as time goes on, a gentleman whom I know will preside with grace and dignity and to your pleasure. I take pleasure in introducing Mr. Albert J. Nason, president, the Nason Coal Company, who will be the chairman of the meeting.

Mr. Albert J. Nason took the chair.

CHAIRMAN NASON: You gentlemen all have a program, I assume of this afternoon's session and you have discovered who are the three estimable gentlemen who are to address us, and you have discovered, or will soon discover, that there is very little use here in a presiding officer.

You know there are some occasions in your life, in which you take huge delight, in view of the situations that have existed in the past, and that situation exists more or less as I present to you the first speaker. He needs no introduction to you. But sometimes there are men with whom you have had relationships and sometimes they haven't been altogether satisfactory, and you bide your time, fairly sure of the fact that there will some time come an occasion when he will fall into your hands, and that situation is somewhat true just now. Mr. Morrow, the vice-president of the National Coal Association, has never done me any injury, and therefore I am not going to try to even up any scores with him, because I haven't any, but this occasion gives me an opportunity to say publicly what I had hoped some time I could say, and that is that Mr. Morrow has very signally and efficiently served the coal industry in the past few years and particularly during the period of the war when we had a fuel administration. (Applause.) I think

very few of us really know all of the service which he performed and the way he saved, mark you, the industry and saved the administration at the same time from errors on the part of the administration and trouble which would have ensued for us.

I am very glad to present to you Mr. Morrow, who will speak to you upon "Co-operative Effort in the Coal Industry." (Applause.)

MR. J. D. A. MORROW: Mr. Chairman and Gentlemen of the Convention:

It is a pleasure to address this gathering on the subject of cooperation in the coal industry. There are two kinds of such cooperation. First, that within the industry itself and among coal operators themselves, and, Second, that between the coal industry on the one hand and all the remainder of the business and political fabric of the United States on the other. I believe that we in the coal industry must give as much attention to the second of these two kinds of cooperation as to the first.

The coal industry has not yet learned the full lesson of cooperation among the operators themselves, but the last few years have taught much of the necessity of united action for the achievement of many common and proper purposes.

For example, coal producers understand the necessity for unified and concerted action with respect to transportation questions. In some of our local coal association, which have been highly and effectively developed and whose membership includes producers distributed over extensive geographical areas, we find operators working out harmoniously questions of rate differentials with a minimum of cost to themselves and with none of the ill-feeling and friction that has so often arisen in connection with differences of this kind. After some years' experience in handling these rate differences in that manner, those operators could not be persuaded to drop their present method of dealing with these questions and go back to the old system of fighting them out before the Interstate Commerce Commission and in the courts at great loss of time and the employment of expensive legal talent. In this same field of transportation there are questions of car supply, yards, tracks and other facilities which affect operators generally and require action by them in groups.

One of our local coal associations is remarkably efficient in dealing with questions of this kind. The operators of that asso-

ciation report daily to the secretary the number of cars they order from the railway, the number of cars supplied, the number loaded and the number standing over at the end of the day partly loaded or empty. That secretary also obtains from the railway officials a daily report of the requisitions for cars in his field, the number supplied and the number standing over empty or partly loaded at the end of each day for each mine. This gives the secretary a full check on the situation. Almost every day he finds some difference between the railway figures and those of the operators. Mistakes are made on both sides. He promptly brings to the attention of the car distributor any failure to furnish mines with the number of cars which they should have, and on the other hand he brings to the attention of that official cases in which mines have received more than their rightful share of cars.

So impartially and so efficiently has this secretary organized this service of mutual value to the railway and his membership that the car distributor now is no longer bothered with scores of telephone calls from individual operators asking questions about their car supply. The operators know that all matters of that kind are being handled for them promptly and effectively by the secretary of their association, and the railways have learned that the secretary has the facts, is fair and will ask for no more than he should have, but will see to it that his operators do get what they are entitled to.

I have personally checked up the results of that secretary's work and I know that this cooperation of the producers in that field through their association and their secretary resulted in their having thousands of cars last year which they otherwise would not have had, and at the same time dissipated much of the distrust which formerly existed among them with respect to each other's car supply. We can measure approximately in dollars and cents the value which that organization has received through the efficient handling of its car supply problem and it has been many times the total expense of running the association. However, although it cannot be so measured in dollars and cents, I am convinced that the better feeling among the operators in that field and the disappearance of the old distrust of each other has been worth far more.

I have no intention of trying to point out the hundred and one ways in which cooperation among coal producers themselves

can be extremely helpful, but I want to emphasize one other illustration, as a further example. In this business every producer is engaged in getting his organization back to a compact, smooth-running, efficient, frictionless machine. The study of his cost statement is the gauge by which he reads the measure of his success in this effort. But a reading of that gauge and his satisfaction or lack of satisfaction with what he is doing is uncertain and incomplete, unless he can compare his performance with that of other producers in his field with conditions roughly similar to his own. If he is a member of a local coal producers' association which collects monthly figures of cost, and if the secretary of that association analyzes those reports and gives summarized statements to his members in proper form, it then becomes possible for each of these producers to check his operating performance in detail against that of his neighbor operator. Such comparisons are highly illuminating. For example, if an operator finds that his haulage cost is greater than that of most mines in his field, it directs his attention to that particular detail of his operation, and in many cases investigation discloses possible improvements and economies which will materially lower his costs.

I mention these things only as illustrations of the practical advantages within the industry itself of the cooperative effort in which coal men have been schooled in the last few years. Just as every other enlightened line of industry in the United States is now organized within itself and has developed effective cooperation between its members, so must we be organized in the coal industry.

As stated at the outset, however, personally I feel that the cooperation which this industry now particularly needs to develop is better cooperation between itself and the rest of the industrial and political fabric of this country. We need a relationship of better understanding between coal producers and coal consumers, which is merely another way of saying that we need more cooperation between these two classes. There was a period when the railroads were embroiled with the rest of the country. Those served by the railways were in opposition to the carriers. The result of that attitude of misunderstanding and hostility is written upon the statute books of the United States today and has riveted fetters upon the railways which have crippled the transportation system of the United States. The railways suffer under that result, but 110,000,000 citizens of the

United States suffer immeasureably more. Thirty years ago the railways needed cooperation and a better understanding between themselves and their customers. Both needed mutual sympathy and helpfulness instead of distrust and hostility.

At the present time there are influential political leaders in many states, there are men high in official circles at Washington, who deliberately desire to bring the coal industry of the United States under the same kind of political control which has crippled our railways and which would soon ruin any industry. If we can develop the right kind of understanding and cooperation between the producers of coal and those who transport and consume it, we need have no fear. After all, that business will succeed best which serves best. Every operator of a coal mine is working for the consumers of that coal. He has made an investment and is devoting his energies and his understanding of the mining industry to the task of supplying them with the fuel which they need. Similarly, the railways that reach the coal mines are working for the coal operator. The producer of iron and steel, copper, aluminum, lead, zinc, oil, the manufacturer of explosives, electrical equipment, mining machinery and a thousand and one other commodities which are used about the coal mines, are also working for the coal producer. The farmers who raise the cattle, wheat, corn, hogs, sheep and chickens which are consumed by the coal operator and his employes are working for them just as they in turn are working for the farmers. In these confused days, amid the clamor of self-seeking politicians, we need to remind ourselves daily of the simple elemental truth of our mutual relationship and dependence upon each other. Such being the truth, it follows inevitably that cooperation between those mutually related and dependent groups is the wise and right and natural condition and that antagonism and the domination and exploitation of one class by another through legislation is fundamentally and eternally wrong.

The President of the United States in his wisdom has called a disarmament conference to meet in Washington on November 11 for the good of the world. We need another disarmament conference to meet every day in every town of this country to disarm the professional agitators and trouble makers who foster distrust, hostility and class antagonism for the purpose of maintaining standing armies of governmental regulators. These men claim that coal is a necessity charged with a public nature and use, as

if that were a fundamentally new discovery about coal, and applied to it exceptionally and alone. That statement is true with respect to coal precisely as it is true of oil, of iron, of copper, lead, zinc, cotton, corn, wheat, hogs, boots and shoes, clothing, hats, plows, washing machines, Victrolas and Ford automobiles, but that gives politicians no excuse for putting the eternal blight of government control upon the production of wheat, the manufacture of motor cars, the mining of copper or the digging of coal. Whatever dissatisfaction may exist with the present condition of the coal industry is due directly to the control which has been exercised over that industry and over the transportation service of the United States by the government within the last few years.

According to the best information which we are able to obtain, the average spot price at which bituminous coal in the United States is selling today is approximately $2.29. Our information also indicates that it is now costing approximately $2.50 per ton to produce this coal, so that under present conditions the bituminous coal industry of the United States as a whole is selling its output at a loss. Some specially prepared domestic lump coal is selling at a price as high as $5.50 per ton, but on the other hand in some fields the screenings which result from the preparation of lump coal are selling as low as 40 cents per ton. The selling price which I have given is the average return to all bituminous coal operators for these different grades and kinds of coal when the necessary weight is given to the quantity of each kind of coal sold. No consumer should complain of a $2.29 price for coal at the mine. It is far less than any other important commercial nation of the world pays for its coal today. The consumer of coal, however, complains because the cost to him in his cellar seems excessive, and he blames the coal producer, distributor and retailer for that fact. He does not realize that when he pays his coal bill he not merely pays for coal but also pays the wages of locomotive engineers and firemen, truckmen and conductors, switchmen and section hands, railroad shop men and office employees, which are covered in the freight charge on that coal; nor does he understand, as he ought, that those wages have been fixed upon their present high scale by the action of duly constituted authorities of the government, and that they prevent the reduction of transportation charges on his coal.

The average freight rate on bituminous coal hauled in the United States from mines to consumers in the five years from 1912 to 1917 was approximately $1.30 per ton. At the present time the average freight charge on each ton of bituminous coal moved from the mines is a little more than $2.50 per ton, an increase of nearly 100 per cent. That total increase in freight charges alone on bituminous coal represents an increase in the fuel cost to consumers of over $500,000,000 per year. The consumer finds fault with the producer for that condition when the producer suffers under it as well as the consumer, and is just as powerless to remedy it.

Nor does the consumer understand that in his coal bill he is paying the wages of coal miners, inside and outside day labor at the mines, drivers, shot-firers, engineers, pump men and other mine employees, whose wages have been fixed on a high scale by action of the Federal authorities; nor does he understand that he is also paying the wages of a score of employees of retail coal dealers which are also on a high level. In brief, the very thing which afflicts him now is the result of precisely the kind of governmental regulation which is being urged as a remedy for the high prices. Instead of a bigger dose of that poison, the American nation needs an antidote.

It is true that the production of bituminous coal in the current year is much below past records. From January 1 to October 15 the total output of soft coal in the United States approximated 315,000,000 tons. This is 120,000,000 tons below the production of 1920 for the same period; it is 60,000,000 tons below the production of 1919 to October 15, and it is 150,000,000 tons behind 1918 for the same period. Nevertheless there is nothing essentially alarming in this condition, because consumption of coal, on account of the industrial depression, has doubtless been curtailed in somewhat similar degree. There are no authoritative figures of current stocks available, but apparently the country is reasonably well supplied with coal today.

There is enormous unused productive capacity of coal mines today.

Although the railways have an abnormal number of cars and locomotives in bad order, there is apparently no reason to fear any serious or extended shortage of cars at the coal mines during the coming winter, unless there is a general and rapid in-

crease in business activity in the United States. Therefore, there is no excuse, under these conditions, for urging legislation for the regulation of the coal business.

It is a notorious fact that the bituminous coal industry is one of the most highly competitive industries in the United States. That competition between thousands of producers insures the lowest possible prices to the consumer.

Most people in the United States do not appreciate the magnitude of the coal business of this country. They think of the Panama Canal as a huge engineering enterprise and consider the excavation of material there as without precedent, but the output of the coal mines of the United States, in 60 days of normal operation, would fill up the Panama Canal. We think of Chicago as a very extensive city—in fact it has almost become synonymous geographically with Northern Illinois—but the soft coal output of the United States every year would cover every square foot of Chicago's area 4 feet deep. It would bury Cincinnati under 11 feet and Kansas City under 13½ feet. If it were spread over the area of Boston it would be 18 feet deep, and if all the skyscrapers were cleaned off Manhattan Island so that it could be turned into one single, huge dump for the soft coal output of the United States for one year, the coal would be piled up 36 feet deep all over the island.

We have enjoyed the cheapest coal and the best supplies of fuel of any nation on the globe. Our great manufacturing industries have been built on the cornerstone of cheap fuel, but our great coal industry, which has made all our other industries possible, has been developed by private initiative. It can be maintained in a condition to serve the public efficiently only by the operation of private initiative. If the consumers of coal are to enjoy the advantages of private operation of the coal mines of this country, they must co-operate with the owners of those mines to insure the maintenance of that fortunate condition, in spite of the efforts of socialistic agitators and self-seeking politicians to fasten government regulation upon this industry.

I thank you. (Applause.)

CHAIRMAN NASON: Mr. Morrow in his address has referred to legislation affecting the coal industry. Unfortunately, we have seen and heard a good deal about it and will hear still more, and it is particularly appropriate that now we are able to

hear from Mr. George H. Bailey, counsel of the American Mining Congress, on "Recent Legislative Developments Relating to the Coal Industry in Washington." (Applause.)

MR. GEORGE H. BAILEY: Mr. Chairman, Ladies and Gentlemen: Mr. Morrow has called your attention to a great many things that he is eminently fitted to talk on as the representative of the wonderfully ably conducted National Coal Association, and I want to call your attention to one thing that will prove to you that you are also in the house of your friends when you are with us—the American Mining Congress.

We have here a Senate bill, an amendment to the House bill of 8245, Senator King, an act that is very short. It says, "Strike out on page 88, lines 18 to 25, inclusive, and, too, on page 89 strike out 1 to 22, inclusive." Now, that doesn't mean very much when you look at it that way, but that means to strike out the parts of the tax bill covering depletion and depreciation. That subject has been a very dear one to all of the mining people. When you look over your balance sheet and see how much you have charged off to depletion, just credit that up to the American Mining Congress, where the idea was incubated, fostered and, with the assistance of all the forces that the secretary and the organization could pull together, finally crystallized into law and perpetuated into the present tax bill. That shows you how completely you are in the house of your friends and what a wonderful thing was given you in justice in that bill.

We are not particularly afraid of that amendment. We have failed on investigation to find where it will find support sufficient to jeopardize the interests and the justice that is done in the present tax law in allowing depletion with depreciation, etc.

Now, there are some other bills, the Briggs and Lodge, regarding pollution of streams, navigable, and their tributaries. There are three bills of that kind. A hearing is going to be had on the 25th on two of them before the House committee, in which any pollution of a stream, navigable or otherwise, is to be passed upon by that committee and recommended one way or the other. We will be able to straighten that bill by making a showing before the committee without any great trouble. It only shows how the minds of legislators go. When you elect people and send them down to Congress, you know you don't give them a certificate of knowledge of your business, and they go down there perhaps not knowing a

thing about your business. When a bill comes up saying that it should be wrong to have the waters of the flows and the streams polluted in any way, it looks reasonable. They think that is good for health and immediately draw the bill as drastic as they can, without any knowledge of what it will do to other things, and someone has got to supply the knowledge by which they can give reasonable judgment.

The condition of all business is of such a complicated nature today that it is impossible for any great number of legislators, whether they are in the Senate or the House, to know sufficiently the intricate conditions of your business and other business to vote intelligently on them without there is some agency to bring before them the facts that are absolutely necessary. So that is what we have to do and what I will call your attention to a little later.

Mr. Herrick has introduced a bill to prevent any use of scrip at mines. Now, I presume that doesn't affect very many, but it will affect some a great deal; probably there are some abuses that have to be followed up. The facts have to be presented and your rights protected. As far as they may be, give all the facts where they will do the most good to those legislators that want to do what is right and want to put only just laws on the statute books, and we find when that is to be done that we are pretty successful in having it done.

Now, those bills that I have mentioned stand on an entirely different basis before Congress and before the public than another series that have been referred to, that started, we will say, with the Calder bill and then the Freylinghuysen and then the Newton bill, which is the Calder bill with some more drastic provisions, and then finally with the two bills by Senator Kenyon.

Now, the Senator Kenyon bills I am not going to refer to in very great detail for the reason that, as was called to your attention this morning by Mr. Peabody, they are in such a condition that they could not be enforced if passed at the present time, and there will have to be a very great study and amendment and working out of the different provisions before they could be considered at all by Congress for their passage.

The first bill against profiteering gives you an idea of the trend of legislative thought that you have got to meet, and that is the limitation of profits. Now, we are very much interested in this

information as to costs. That reaches beyond coal. Sometimes people say that those so close to the picture don't get the proper perspective. There is no other class of business that would welcome a complete disclosure of its cost, a complete disclosure of its profits to the extent that is demanded in this series of bills—the Calder, Newton and Kenyon, the federal coal bill and the profiteering bill —than the coal industry. Now, he fixes profiteering all the way from fifty cents down to twelve and one-half cents a ton, according to the production or according to the amount of coal handled. Now, there are a good many today that would like to take off that fifty cents a ton profit. There are some that would be very glad to have that twelve and one-half cents profit rather than to have the twenty-one cents on the other side just referred to by Mr. Morrow. Probably seventy-five per cent of the coal that is sold today outside of standing contracts is sold at a loss.

These bills stand on a different foundation and are sponsored in response, you might say, to the demand of the public and an indignant Congress. Congress is indignant at what they think has been the wrongful handling and the vicious handling of the public interests by the coal producers. Now, you and I know (at least I believe that the information that I have is reasonably exact) that probably the condition that has brought about that censure that has created that condition in Congress, that attitude toward your industry, was no doubt founded upon the wrong facts of not to exceed five per cent of the producer and fifty per cent of the coal dealer. I presume that is a liberal percentage. The rest of the business has been carried upon a high plane. There were a few that took advantage of conditions—conditions growing out of the war, the war shortage and strike conditions—that have inflamed the public mind to its present condition.

Now, I do not consider that it is necessary to go into the details of the Kenyon bills, to call your attention to this and that and the other things, until they are whipped into shape or until they become a greater menace on their way to passage as a law, for the reason that public sentiment will be enlightened in the near future, I think, as to the actual conditions.

As a matter of fact, if a diagram was drawn that the public could look at of the coal industry extending over a period of the last ten years, you would have a tracing going up something like this for transportation, labor, taxation, and you would have

profits running along here rather evenly and then a little jump here during the war and then back, running a little below cost again. Now, the public is still thinking about that jump that was made during the war. They are still thinking about the time when there was perhaps more than a reasonable profit to some extent. They are not thinking about the coal industry as it is today. If the public could know the actual condition, know that there is an opportunity to get, if cars can be provided, at any time fifty per cent or seventy-five per cent more coal than they will need, that there can't possibly be another runaway market, they would quickly subside as far as hostility is concerned, Congress would cease to reflect the hostility that exists and things would assume a normal condition toward the trade, and the men that are engaged in it would receive the honor that is their due; there is no question of that. But we have the public condition that I have described and it has got to be met and public sentiment has got to be taken up and got to be directed along the lines that will not obtain or sustain such drastic legislation as the Kenyon bill. It should obtain for the industry really helpful legislation that will enable it to better serve the people and that will enable closer co-operation.

This morning your attention was called to the fact that farming and laboring organizations could combine, and that coal and other organizations could not. It is readily seen that you can correct that injustice; that if you will provide an agency by which co-operation can take place by the operators or any other part of the agencies distributing the coal you will lessen the price. What would be the result of a Calder bill or a Kenyon bill if it could be placed in effect? It would probably double the cost of coal to the consumer. There would be no possibility of carrying on the business on the present economical lines under such conditions. Mr. Peabody this morning spoke about it, calling for something over eighty men in his own organization, simply to carry on and to collect and hand over the data that it would require. That has got to be paid for out of the coal; the consumer has got to pay for it, and so it goes. Multiply it a hundred times as you go on down through the great number of producers.

Now, it is absolutely necessary (I believe this is the consensus of opinion of some of the best producers in the country, those having the welfare of the industry in the country at heart) that

public sentiment must be molded to what conditions are—simply the facts of the industry and its needs.

I think that the President's letter that he sent here, when he asked this organization to help solve those questions, imposed to an extent a duty upon those present to undertake to find out just what is necessary to fix that program as quickly as may be. Let the best judgment decide what it shall be, and then unite and carry it out, and public sentiment will do the rest and there will be no hectoring from these faults, friends, as they think them to be, of the industry or of the people. No one, if he knew the facts, could conceive the author of such a bill as the Kenyon bill being a friend of the producer. This co-operation that is asked for has a splendid field for work. I am sure that it will be easy to find methods and ways to not only direct your activities towards proper legislation, but so mold public sentiment that there will be no support for anything of that kind.

I thank you. (Applause.)

CHAIRMAN NASON: Mr. Stuke of the University of Illinois has a brief announcement which he would like to make to you.

MR. STUKE: Gentlemen, Mr. Morrow has spoken of co-operation in the coal industry. There is a form of co-operation along technical and investigational lines that has been in progress in this state for the past ten years; that is a co-operation between the United States Bureau of Mines, the Illinois State Geological Survey and the University of Illinois, acting through its Department of Mining Engineering. That work has been in progress for about ten years, and on behalf of Dr. Rutledge, the superintendent of the Bureau of Mines of the United States, Mr. Wolf, the director of the State Geological Survey, and myself, representing the University, we would welcome all those who are interested in these investigations as they have been carried on in Illinois to a conference to be held Friday morning of this week at the Congress Hotel at ten o'clock. That includes operators, miners, engineers, anyone who is interested in our problem.

Those of us who have had the immediate direction of this work feel that we should know whether or not what we have been trying to do has been done effectively, whether the results produced have been worth while and are of any value to the coal industry of the

state, so we want a plain, unbiased expression of opinion and suggestions for the carrying on of our work in the future.

Thank you.

CHAIRMAN NASON: You notice on the outside of the program the slogan, "Plan for Prosperity." If there is any man interested in that slogan and is doing all possible to bring natural conditions, it is our worthy President Harding.

It was thought quite proper that the President should be at such an important gathering as that which is staged here this week by the American Mining Congress and an invitation was extended to him, and an urgent invitation to be here to speak at some one of these gatherings, and the President was gracious enough to say that he wanted very much to come. There are certain reasons which were detailed in full which seemed to be sufficient and to satisfy in answer that much as he would like to come, he could not. He has, however, sent a message to this Congress and it will be presented to you now by Secretary Callbreath.

SECRETARY CALLBREATH: Mr. Chairman and Gentlemen: I have also a telegram which should have been read before our good friend, Mr. Morrow, addressed you. The letter from the President should have been read at the morning meeting. It was called for, but I failed to read it because I had loaned the copy.

I am reminded very much in my effort now to bring these before you of the corpulent lady who tried to get upon the street car. She stopped at the rear end and the entrance wasn't large enough, and then she rushed to the front end, and that also seemed to be very narrow, so then she started back to the back end, and the conductor said, "Say, which end do you want to get on?" She said, "You hold the car a minute and I will get both ends on."

I will try now to get both ends on, and I first want to read a telegram from the president of the National Coal Association.

"Mr. W. J. Loring, President, American Mining Congress,
"Congress Hotel, Chicago, Illinois.

"It is a great regret to me that I cannot be with you for the annual convention of the American Mining Congress and participate in the National Exposition of Mines. Until the last minute I hoped that my physician would consider me sufficiently recovered from my appendicitis operation to allow me to make the trip to Chicago but in this I have been disappointed and have to ask that Mr. J. D. A. Morrow be allowed to take my place on the program and represent me in Chicago on behalf

of the National Coal Association. I extend the American Mining Congress best wishes for a most successful meeting.

"J. G. BRADLEY, National Coal Association."

Mr. Chairman, it seems to me proper that in view of the extended sickness of the president of the National Coal Association, and his great desire to be with us and our feeling of sympathy for him, that this organization ought to send to him a telegram extending our sympathies and our wish for his early recovery. I move you, Mr. Chairman, that such a telegram shall be sent by the secretary of this organization.

(The motion was seconded and carried.)

SECRETARY CALLBREATH: I will now read the letter from President Harding:

THE WHITE HOUSE
WASHINGTON

September 30, 1921

Gentlemen:

I regret exceedingly that earlier engagements make it impossible for me to accept the invitation to attend your Annual Convention.

"Realizing the unfortunate estate into which the mining industry has come, along with so many others, in the period of depression following the war, I regard as especially important the effort of your Congress to bring about an early improvement.

"The present unfortunate situation being a world-wide one, resulting from world-wide causes, complete recovery must await improvement in world conditions; but there are indications that industry is on the upgrade and mining is sure to reflect the improvement which is marked in some other directions.

"I cannot forbear to suggest that your Congress might perform a useful service in connection with the improvement of conditions in coal mining. A widely variable demand makes the problem of production difficult, especially when it involves an overload of the transportation system at a time when that system is least able to bear it.

"With both labor and facilities lying idle for substantially half of each year, the costs of coal are bound to be unsatisfactory to the consumer. Is there no way of regulating the demand so as to distribute it more uniformly over the twelve months? Is it not possible to provide storage reservoirs which will enable the large consumers and large producers to accommodate their conditions to the need for a more constant rate of production?

"I feel that these questions may, with particular propriety, be addressed to your organization. Adequate improvement can hardly be expected in the coal mining industry until the army of working men and the vast capital engaged in it find constant employment.

"I would be glad indeed if your deliberations might produce some suggestions of practical value in dealing with this difficult problem."

Very sincerely,

(Signed) WARREN G. HARDING.

The American Mining Congress
Congress Hotel
Chicago, Illinois.

CHAIRMAN NASON: You will note how each address this afternoon has led to the one to follow. Mr. Bailey has told us that the legislation proposed at Washington seems to require that the public be better informed concerning the coal industry, and now you are to hear from Mr. C. E. Lesher, who is now the editor of "Coal Age," and formerly was in Washington, on "Telling the Story of Coal to the Public." (Applause.)

MR. C. E. LESHER: Mr. Chairman, Ladies and Gentlemen of the Convention: I have written rather to the subject, "Selling the Coal Industry to the Public," than the title which has been read.

Because the people have no confidence in the coal industry should be no cause for us to despair. Coal is not alone in this respect. Throughout this country, throughout the world, there is a growing discontent with the whole fabric of our social order. Three quarters of the populace is reaching for new isms, expressions of dissatisfaction with our social institutions. The Plumb plan, the Calder, Frelinghysen and Kenyon bills, the packer legislation are but the manifestations of this discontent. We are prone to think and speak of ours as capitalistic system. It is anything but that, it is an individualistic system. The lowliest coal digger, can, has, and we hope always will have the opportunity to rise to mine owner and operator. Some of you may have started that way. We all know those who did. And we know that some have risen to be thrust back again because they were not of the timber that can carry the load, that is the burden of the man at the top.

Because ours is the best and greatest social system in the world, we should assay the spirit of unrest and where we can reach the cause, correct it, each within his province and industry. There falls on those who can keep clear heads these days the fundamental necessity of protecting the foundations of our institutions, of seeing the country through this winter, and the next few years, if need be, until sanity returns.

What has all this to do with coal, and with selling the coal

industry to the people? Just this. The people who burn coal are dissatisfied with the price. The country is thoroughly sold on the idea that we must get down to a steady, normal basis, and proceed as usual, but no one is willing to voluntarily take his medicine. The man whose income is from his money and the man whose income is from his labor, alike are seeking some way to justify keeping his level up while the other fellow takes the decrease. Collectively we are anxious to hurry the process of deflation, we know it must be consummated before we can resume a satisfactory rate of business. The delivered price of household anthracite is about double pre-war, that of bituminous for domestic use is but little lower relatively if the coal comes from union fields, but much lower if from the non-union mines.

It is price and price only that is at the root of the public's questioning of this industry. The demand is for lower price, the consumer cares little how that price be lowered, he is demanding that it come down. In this we must appreciate that it is the ultimate consumer, the man who cannot pass on the cost of fuel, the householder, in other words, that we are considering. For him coal is an inescapable necessity and to him the cost in dollars of his winter's coal is an item of greater magnitude than for any other thing save food he buys outright.

When we say that we should sell the coal industry to the public we mean that we want to show the people that certain conceptions are misconceptions. For instance, the individual consumer with whom we are concerned, and who burns one in six of the tons of all kinds of coal produced in the country, thinks that the price of coal is controlled in the interests of the coal man. He knows the coal industry only through his contact with the retail dealer. He knows what is a fact in most cities, that there is one price no matter from whom he orders. He harks back to the old days when there was an anthracite trust, just as there were combines in many other industries and when the railroads were unregulated and indulged in unwarranted practices. Not only the average, but 99 per cent of the people in the country know nothing about the coal industry. The men in it know altogether too little. We all have just begun to find out the activating causes of the big movements or price and distribution, marketing in other words. The man who buys coal for his home is just as suspicious of the coal industry as you and I are likely

to be when we buy a pair of shoes at a price as high now as the highest during the war.

The public has no conception of the difference between the hard and soft coal industries. We know that what we can say about one is the opposite of what can be said about the other. In the domestic sizes, hard coal is non-competitive as compared with all bituminous coal trade. Both are labor ridden, but one more than the other for the anthracite miners do not have the checkoff. Yet the coal consuming public in the East that uses hard coal is forming one opinion of the industry and the coal consuming public in the West that largely uses soft coal in its homes is forming its opinions about coal on another set of facts.

So as a first requisite to selling the public the coal industry I should put the necessity of a realignment of our thought as to how the industry should be divided. Instead of the anthracite and the bituminous operators, whose problems of production, distribution and price are widely different, we should look at the problem as divided between the marketing of domestic coal and of industrial coal. We know that big business, the railroads, the packers, the industrials, even the public utility plants, are able in the long run to take care of themselves. They use coal as a raw material, just as they use iron, steel, copper, lumber. They are able to pass on to the ultimate consumer in price of their finished product whatever price they have to pay for coal. Unless they can they are not successful in their enterprises.

But the householder takes coal as a finished product. Furthermore to him it is an essential; so essential that there is a powerful sentiment favoring the idea that coal is charged with public use. Perhaps coal for the householder is charged with public use, perhaps insofar as coal is the fuel that keeps the houses of our people warm, it is a public utility. Certainly not beyond that point, any more than other basic commodities, as iron, steel, metals, lumber and oil. But the great difficulty is to separate the two kinds of coal, the raw material and the finished product, in our own minds and in the minds of the public and to get treatment and consideration for each befitting its merits.

The disturbing legislative proposals that continually bob up

in the Congress and in our State legislatures do not originate with the legislators, except possibly as to form. They are manifestations of the public discontent with the price the voters have to pay for the coal that goes into their cellars. In the past year I have talked with many large industrial executives. I have yet to find one who did not discuss coal from the standpoint of his own personal coal bill, rather than from the standpoint of his business.

Therefore, our problem is to get to the voter with the story of coal, the coal he puts in his cellar. Until quite recently there has been no effort to stem the tide of hostile legislation except at the final stage. You remember the harrowing details of the great Dayton flood in 1913; how a vast torrent of water inundated that fair city and caused untold loss of life and property. When the rains that caused that historic flood started to fall, there was no way under Heaven to prevent a catastrophe. What have the people in the Miama valley done since then to prevent a recurrence of such a flood. They have gone back up the valley to the farthest limits and built dams. Dams across dry valleys, if you will, but dams that will catch the next flood before it starts. I am not sure but that it is too late to stop a catastrophe in the coal industry, but it is surely worth while trying while the weather is fair. There is no basis of permanent peace for the coal industry pursuing a policy of waiting for the bogey of restrictive legislation to bob up in our legislative halls and there to strangle it. The place to set the coal industry straight is back home where sentiment originates.

There is and can be no basis of fact for the regulation and control of the coal industry insofar as the steam and industrial trade is concerned. Selling coal, both hard and soft, on this market is so highly competitive that there is nothing to be gained by such a course and much to be lost. The danger lies in the other direction. The anthracite producers have more at stake here and the bituminous men, for their business is in domestic coal. Steam coal to them is a troublesome by-product. It is not surprising therefore that they have been the first to go before the individual consumer through the medium of the newspaper with their story. And they but started a few weeks ago. They have reached a point where although a natural monopoly they are asking the public for the right to live as individuals.

This campaign of the anthracite operators is a tremendous step forward. So far it has been disappointing to me in that the story they are giving to the public falls short of satisfying because it tells but one third of the story to the reader. Coal at the curb is what interests the voter. The anthracite operators advertisements carry the story no further than the mine and breaker. The reaction I have noted is briefly, "Well, I cannot see how it can cost nearly $8.00 to mine a ton of coal, but even if it does, some one along the line after it leaves the mine is gouging us."

The anthracite operators are evidently proceeding on the assumption that they will tell the story of why it costs so much to mine and prepare their coal and then let the railroads tell why it costs so much to transport it and in turn the retail dealers shall advise their customers that they in turn have troubles and high costs. But if the railroads and the retailers fall down on this end, there is no assurance that voter will be satisfied and let the producers alone. So far the public is getting explanations. The industry is on the defensive.

The second step in selling the coal industry to the public is therefore to get on the offensive. Recognizing that the discontent is on price, the producers of all coal should go before the individual consumers in an extensive campaign not to explain the price but to make them satisfied with the price. You know that it is not price that sells coal. It is quality and service. I thought I had seen the greatest expression of confidence when recently I read a letter to a coal company directing the shipment of coal and saying that the matter of price would be left to the shipper. But yesterday a producer told me that he had customers who merely ordered coal and never even mentioned price. Confidence first, then quality and service, and price will cause no tirade in Congress.

Confidence must start and largely end with the dealer with whom the buyer comes in contact. He is your ambassador. I can see no hope of your educating the retailer in the way that he should go. There is another surer way and that is to educate the people and they will force the retailer into line. Tell the public the whole story from mine to curb, set up standards of merchandising, raise the level of the coal industry, as the public sees it, from dirty back alley quarters to the dignity of State

Street. Tell the people what to expect in the way of service and quality and they will demand and get it.

Forget your trouble and concern yourselves with the troubles of the public with coal. Gain confidence and then when you have difficulty they will listen to you. You can go into the office of the buyer of coal for big business and set him straight but you cannot reach the festering sore of public discontent that way. It will cost a million dollars a year to do what I propose, and it will reach but a small portion of the total trade in point of tonnage, but failure to do it is jeopardizing the entire industry.

CHAIRMAN NASON: This completes the formal part of the afternoon's program. I would like to ask Secretary Callbreath if there are any announcements to be made.

SECRETARY CALLBREATH: The first announcement that I would like to make is the request that all who have resolutions which they desire to be considered by the convention shall have them prepared and introduced in the regular way. The regular way is that they are to be read by the secretary to the convention and referred to the Committee on Resolutions without debate. The Resolutions Committee, as before announced, is made up by the delegates of each of the several states, one representative from each of the states. Those will be called for at the opening of the evening session, at which time the introduction of resolutions will be in order.

I particularly request the selection of the members of the Resolutions Committee by the several states, so that we may have the committee quickly organized, because it has the hardest work of the convention to perform.

I feel that we should give some special attention to the suggestion or the request of President Harding with reference to some action by this body to solve a difficult situation. It seems to me that the President's request is a demand, a command upon us to act, and, therefore, I believe we should meet that in the spirit in which it is given to us. I believe that each of the different divisions of our organization should prepare the resolutions affecting that particular industry. This particular coal conference, in my judgment, should present to the Resolutions Committee of the general body those resolutions which it desires to have considered, and I feel that we should make some effort, Mr. Chairman, to provide a committee which will prepare a resolution to be submitted to the

Resolutions Committee for its consideration. I think that ought to be done and I will leave it to this body to work out the plans by which we may meet the command of President Harding.

MR. FRED C. HONNOLD: It is clearly evident that this conference of coal men cannot neglect the suggestion of President Harding. Whatever our notions may be about the accomplishment along lines he suggests, it must be considered and covered properly by an appropriate resolution.

I would like to move that the Chair, or Mr. Callbreath, in collaboration with perhaps Mr. Morrow, select an appropriate committee of not to exceed five coal men who will prepare an appropriate reply that shall be referred to the Resolutions Committee of the Mining Congress for their action.

(The motion was seconded.)

CHAIRMAN NASON: You have heard the motion, which is, as I interpret it, that Mr. Callbreath, secretary of the Mining Congress, in co-operation with Vice-President Morrow of the National Coal Association, name a committee of five from the coal industry to consider the matter presented by the President's letter, and prepare an appropriate resolution for presentation to this conference. The motion has been seconded. Are there any remarks?

SECRETARY CALLBREATH: I would like to suggest an amendment to that motion, and that is that the chairman of this meeting shall be a member of that committee, the chairman of that committee.

CHAIRMAN NASON: Secretary Callbreath is ruled out of order and the motion is that the committee of five be named by Secretary Callbreath and Vice-President Morrow. Are there any remarks?

(The motion was carried.)

MR. BARTLETT (Cleveland): They were complaining about the noise here. It is almost impossible to hear a speaker when you are back four feet from where I am now. It would seem to me as though we ought to make some arrangement where we could meet over at the hotel, so we could hear. It is very embarrassing to us out here and more so to the speaker. Can't we make some arrangement so there will be either less noise or get somewhere else?

CHAIRMAN NASON: That comment will be considered by those in charge, I am sure. Is there anything else to come up?

SECRETARY CALLBREATH: Mr. Chairman, in view of the fact which will be shown by the report of your committee, I have selected myself as chairman of it, against the wishes of my confrere, Mr. Morrow, upon the committee, and if this body will recognize me as the majority of the committee I will make a report for the committee. The report is that this body shall select as the members of the committee, in accordance with the motion of Dr. Honnold, Mr. Nason, Mr. Morrow, Mr. E. W. Parker, Mr. Carl Scholz and Mr. A. D. Cameron. (Applause.)

CHAIRMAN NASON: Is there any other action to come up before this conference, or any further business?

MR. HONNOLD: I move that the report of the committee in the selection of this committee be approved.

(The motion was seconded and carried.)

CHAIRMAN NASON: If there is nothing further to come before the conference, we will stand adjourned.

(The meeting adjourned at 4:15 p. m.)

National Mine Tax Conference

OPENING SESSION

TUESDAY AFTERNOON SESSION, OCTOBER 18, 1921

The opening session of the National Mine Tax Conference, held in connection with the American Mining Congress at Chicago, was called to order at 2:45 p. m., by Mr. Paul Armitage, presiding.

CHAIRMAN ARMITAGE: The particular subject of the meeting today is uniformity in taxation of mines among the various states. There are three distinct and mutual inconsistent points of view of taxing mines that have prevailed among the various states; one of these is a policy of subsidization, the next is a policy of equalization, and the third is a policy of penalizing the mines. There has been a progressive movement in recent years among the states toward the penalization of mines particularly in certain states. That movement has been growing in force until in certain states the mines are in a position where they can not operate against that penalization. That was partly due to the enormous profits that were made by certain of the industries during the war, partly due to a progressive tendency of operation of mines and mining industry, and partly due to a growing tendency among the states of extravagance in expenditure.

Now the first important thing for us to dwell upon here is this fact that mines are a national and in part an international enterprise. They are not a local enterprise. In that respect they are entirely distinct from real property. Real property, for example, in matters of taxation is almost entirely local, it does not compete with any property outside of the state. On the contrary, mines are not local, they do not sell their produce in the states, they sell them over the entire country in competition with mines of other states and mines of other countries. Therefore, the need of uniformity of taxation becomes paramount.

From a point of view of production a mine is local. It produces in the state. But from the point of view of distribution and sale, it is national. The sale of its product is really the point of contact in which the mine comes in competition with other mines. That is the point of stress. If, at this point, it can measure up to the other mines that it meets, if it can compete with them and sell its product, it succeeds; if it can't, it goes under. Cost of production is an important factor, therefore, in that competition and one of the elements of cost of production is the local taxes. If we look upon local taxes merely as an element of cost of production, an item in cost of production, we

will see how important it is that that particular element be made uniform as far as possible.

The federal taxes are uniform all over the country. The state taxes are far from uniform. One state levies taxes on certain industries at the rate of 1.7 cents per pound, another state levies them at the rate of one-half a cent per pound. How can industries in those two states compete on equal terms with those conditions?

The three great things that are worrying the mining industry today are: high cost of wages and labor, high cost of transportation, and high and discriminatory and un-uniform taxes. The railroads are recognizing that and are endeavoring to make their rates uniform. The illustration of that is the long and short haul. For example, the mines get a rate on copper, with which I am familiar, to the seaboard, to the East, of $16.50 per ton. That rate is almost uniform in Montana, in Arizona, in Utah, and elsewhere. Wages are mobile. They take care of themselves more or less. If there is a tendency to equalize wages in different states, the taxes have no such tendency unless the mines themselves initiate some sort of a movement, some sort of a concentrated effort to make taxes uniform.

There are two ways the states accomplish the penalization of mines: They raise the tax rate directly against the mine. They put on an ad valorem tax and add to that a tonnage tax. Minnesota has distinctly penalized mines. It has an open policy of penalizing mines. In the first place it has an amendment to the constitution which taxes mines to 50 per cent of their value, other property is taxed to 30 and 40 per cent of its value. In addition, it has an occupation tax which is added to that. Another way to accomplish this result is to increase the value of the mines, to gradually add on valuation, increasing it by different methods, increasing it by changing the factors of valuation until the mines are paying a greater share of the tax in that particular state than in other states. Now these conditions have moved the Mining Congress to invite here their representatives to discuss this question and it is a most serious one now. It is far more serious, in my estimation, than the federal tax is. We are going to discuss this and see if it is possible in any way to arrive at some sort of uniformity in state taxation, to arrive at some principles of uniformity and to initiate some movement toward the accomplishment of that result to mold out the unfair discriminatory taxes of some of the states against mines. Mr. Kriegh of the Tax Division of the American Mining Congress has prepared here as a basis of this discussion a summary of the state taxation and revenue systems of the various states. I will ask him to explain that briefly. This summary is here for distribution among you gentlemen.

MR. McKINLEY W. KRIEGH: Gentlemen, I have very little to say about this summary. When it was decided to make the subject of state taxation of mines the principal topic of this conference, it was thought necessary to have something here that would be a convenient reference, and work was immediately begun on this summary. It is practically complete based on the existing laws of 1919. Wherever current reports were available the laws were brought up to date. There may have been some inaccuracies which crept in, but I think in the main you will find it accurate. The time was insufficient to make an analysis of this summary which could be read at a glance and so you have it as it is here, and as the various state delegates take up the subject about the laws of their particular states, you will have convenient reference to a skeleton of the laws of that state. There are two or three tables at the end of the summary which you will find somewhat interesting with reference to the per cent of increase of taxes during the past few years. There is one table there showing total revenue receipts by states. Revenues for counties and municipalities were not available so that we have only the per cent of increase in the state revenue receipts from taxes.

CHAIRMAN ARMITAGE: Gentlemen, there is a very active body which has been working for a great many years on the subject of uniform state laws. This body is known as the National Conference of Commissioners on Uniform State Laws. It is an official body in the sense that it represents delegates appointed by law by the various states of the union for the very purpose of devising and procuring the enactment of uniform state laws. That body has been eminently successful. We have with us today the Chairman of the Executive Committee of that body, General MacChesney.

General MacChesney is a member of the Chicago Bar and for a great many years was President of the Illinois Bar Association. He has been most active in the work of that Association, interested in the needs and the interests of it. Part of the work of that Association has been an endeavor to obtain uniform taxation laws. We have invited Mr. MacChesney to explain the work of that Association, its nature, its ideals and purposes and objects and its successes. He has kindly consented and I take great pleasure in calling upon Mr. MacChesney and introducing him to you.

GENERAL NATHAN WILLIAM MacCHESNEY: Mr. Chairman and Gentlemen of the Tax Conference: When the subject of uniformity was selected for discussion here, it seemed desirable to the committee, I was informed, that you should be advised as to just what efforts had been made in the direction of uniformity of legislation in this country in order to appraise properly the difficulties which you would have to face and the

probabilities of success you will achieve in the field of uniform taxation.

The National Conference of Commissioners on Uniform State Laws is, as has been said, an official body. It held its thirty-first annual conference last year at Cincinnati for a week preceding that of the American Bar Association, and has to its credit the passage of something like four hundred legislative acts in the field of uniform state legislation. It was first called together upon the suggestion of Governor Hill of New York about 1890 to see whether or not, in view of the handicap put upon commercial enterprises by lack of uniformity, something couldn't be done. Following that it has met every year and it was created by statute in the various states, its representatives being appointed by the governors under legislative authority and meeting in annual conference. In most of the states these commissioners or delegates are organized into a state commission as they are in this state for the purpose of promoting uniformity within the state itself.

The National Conference of Commissioners on Uniform State Laws started out largely from a commercial point of view and one of the first topics it took up was that of negotiable instruments. That negotiable instrument act which was drafted by the conference has been adopted by 51 jurisdictions of the United States in various states, territories, and the District of Columbia. A number of other acts have been almost as widely adopted. Following the adoption of certain commercial acts the conference went into the field of the so-called social or family acts like marriage and divorce, child labor, and so on. It found that while great encouragement was given to its commercial acts that it was somewhat difficult to get as widespread interest in the field of social acts. About 1908 the conference approached certain of its acts from a new angle, notably the Workmen's Compensation Act and one upon occupational diseases as a result of a suggestion from the then Governor of Massachusetts who, in an official communication, asked that the conference take up the questions of workmen's compensation, pointing out that a state like Massachusetts, which had a workmen's compensation act which placed a burden on the various employers of the state, was under an economic handicap as compared with states that had no such law. Therefore, it was to the interest of the business of those states which desired to maintain high standards that the acts on that subject should be uniform. For the first time in the history of the conference these so-called social acts were approved from a purely business point of view. It seems to me that is a very proper point of view from which they can be approached.

Your Chairman has said that the matter of land taxation is purely a local matter. I would be a little inclined to challenge that, though that is substantially true. Land taxation is much

more of a local matter than the taxation of movables of any kind, but, nevertheless, it is true that the tax upon plant investments do have something to do with manufacturing companies in close competition and it becomes of interest to the manufacturers that their plant equipment should not be taxed on an excessive basis. As has been pointed out here in the question of mine taxation, it is still more important that you should have some uniformity of taxation throughout the country. Perhaps before I discuss in detail how I think the National Conference might be of service to you gentlemen in the field of uniformity, it might be well to tell you, briefly, of the methods of work of the Conference of Commissioners on uniform state laws.

This conference meets once a year but it has certain standing and special committees which are functioning during the year. It has a committee called the Committee on Scope and Program, which in a general way determines the plan upon which the conference shall act. That is an elected committee representing the geography of the United States pretty well. It also determines what subjects come within the proper scope of the conference itself in view of the crowded program that is always presented to it. That committee reports to the conference and if, in its judgment, a particular subject suggested is a proper one for the conference to take up, it is the custom to authorize a special committee on that subject. That committee, as has been the practice, obtains an expert draftsman to draft a law intended for consideration and in the drafting of that law there are hearings held in some convenient point; for instance, on the commercial acts and bills of lading act, the railroads, the shipper and the warehouse men, and everybody were interested. In the negotiable instruments act, they had the bankers and everybody interested in that subject.

An act is then drafted and discussed, is reported back to the conference as the first draft of an act. Under the rules of the conference it must be discussed section by section before it can be given final consideration and must go over one year when it is sent out to all the interested bodies throughout the United States for specific criticism. If it comes back in the form of a tentative draft it may then be adopted. If it is adopted it is recommended to the states for adoption when introduced by the legislators of different states.

You take Illinois for instance, in our legislature we have a committee on uniform state laws in the Senate and in the House. In the last session of the legislature if an act was a uniform act instead of going to a committee on taxation or a committee on what not, it was referred directly to that committee on uniform state laws. In other words, the whole effort such as is put into this movement by the National Conference of Commissioners on Uniform State Laws is largely dissipated if, when the act

reaches the legislatures, each legislature is to exercise the prerogative of amending the law to make it what they deem a better law. So instead of referring such act to the committee on the subject matter of the act, it is referred to a committee on uniform acts and will be considered from the point of view of desirability of uniformity and, if the committee decides to recommend it, it will be recommended as a uniform act which does away with the constant meddling with these acts.

It has been said that this whole movement for uniformity of legislation is not only a difficult one but a futile one because of the danger constantly of having uniformity interpreted out of them by decisions of courts and that is a very real danger. During the last year there were 810 decisions upon the subject matter covered by the uniform acts, in the courts of last resort in the United States. Of these, 316 of the reported decisions were based upon and decided in accordance with the rule of the uniform act showing that the courts are at least beginning to not merely interpret these acts which was the course they pursued in the first few years of the work in the light of their previous law on the subject, but are taking into consideration the fact that these acts were intended to make the law uniform and, therefore, they will render their decisions in the light of uniform acts in effect in the various states and not in the light of their prior decisions on the same subject before such acts were passed. In doing that, they take into consideration not so much their own prior decisions but decisions of courts in other states where the same provisions of the uniform act have been interpreted rather than the decision of their own court. It would be quite interesting to some of us perhaps if the time permitted to discuss in the light of that principle the acts of some of the courts, but on the whole the most important commercial states of the union are pursuing the policy of endeavoring to keep the interpretation of the acts as well as the text uniform.

I have discussed somewhat the scope and organization and methods of the conference and the extent to which its acts have been passed and interpreted. It might perhaps be interesting to run over a few of the principal acts and show how many states have adopted them. For instance, the negotiable instruments act has been adopted in 51 jurisdictions which was the most successful one; the sales act was adopted in 23 states; the warehouse receipts act in 45 states; bills of lading acts in 23 states; desertion and non-support act in 10 states, and there are a large number of other acts in various states ranging from 2 up to 16 or 17. On the whole, the states which have been most prompt in the adoption of the acts have been eastern states like Massachusetts, Pennsylvania and New York, although Illinois until this last session of the legislature ranked among the first

group of those having the largest number of uniform acts in effect. Very few, however, have paid the compliment to the National Commission of Uniform State Laws that was paid by the legislature of Alaska which took 8 of our acts and passed them without a single change, leaving even the final bracket in place which said "this law will become effective on blank day of blank." I plead for no such uniformity but only for that reasonable degree of uniformity which will keep the factors effectively working together.

This whole question of uniformity is spreading and becoming more and more interesting as the scope of it is widened and it is realized it has a positive economic aspect which those of us who have been interested in it as a philosophy and social progress hope it will bring to our forces a large number of people who will be interested in widening the scope of the work. One very interesting recent addition was the discussion on inter-state compacts by Dean Wigmore of Northwestern University.

The constitution of the United States provides that the states shall not enter into compacts between themselves without the consent of Congress. That consent has been given in certain instances; for example, bills passed permitting Michigan, Indiana, Illinois and Wisconsin to enter into compact with reference to criminal jurisdiction upon Lake Michigan, and there have been a number of other instances, including one on the development of New York harbor between New York and New Jersey. The question has arisen in commercial conferences interesting the oil interests of South America and Mexico with the particular subject dealt with as at home within the jurisdiction of the states. Where there is to be general uniformity of treatment, it must be done by national agreement. Mr. Wigmore has urged that this question of interstate compact be broadened so that by consent of Congress, the states will be permitted to be represented in such commercial conventions with foreign states in order that the whole subject may be worked out with some degree of uniformity.

Why hasn't the conference contributed something to the field of taxation which, of course, is one of the most vital fields? Well, as I have said, the conference found that its easiest field was in the field of commercial law, commercial papers, negotiable instruments, bills of lading, warehouse receipts, etc., and that it found a disinclination even in the field of family law to pass its uniform acts. That wasn't so much because of lack of interest in those subjects but because it was pretty hard to persuade people with reference to divorce in South Carolina whether it was the same in Illinois and tell them what the law was. It is just as Judge Pike told me in Nevada when I sat with him and heard some of the divorce cases. He said the law of Nevada was intended to wash the dirty linen of Nevada and not for

other states. He wished people would stay away and let them alone in Nevada.

When it came to the field of real estate law it was found almost impossible to get any progress at all in the line of uniform legislation with regard to wills, real estate, or anything involving titles to property, etc., because people regarded it as their own local concern.

That has been true also in the field of taxation. The conference retained for a number of years a committee on taxation and they were presented with certain preliminary reports and it never could get anywhere when it came to working out some uniform system. Each state regarded it as its own concern and went on the principle that the right to tax was the right to raise the money where it could until the squeal became so loud they had to desist. On the other hand, I think there is a growing feeling that a state can not afford to penalize its own industries in such a way as to drive them all away from the confines of the state. If approached from that point of view some progress might be made.

A very much better case can be made in connection with mining taxation, for instance, as has been stated here. If this conference is interested in having the co-operation of this body that has been successfully operating in other fields, the way to get it would be to appoint a committee here to prepare some sort of draft, if you please, with a brief as to why you think the mine taxation is a proper subject for uniformity. Then present that to a meeting of the Scope and Program Committee which will meet in the mid-winter at Tampa, Florida; it is either January or February, I believe. Then if you can persuade the committee on Scope and Program that some action should be had, real progress could be made at the next annual conference.

It seems to me that if the conference makes up its mind that state uniformity is desirable in this field as it would seem to be, that the National Conference of Commissioners could be of very real service in placing at your disposal, upon proper presentation of the subject to its organization, its methods of work would give it the sort of backing which it is in position to give because of its long history in this field. It would have to depend on you gentlemen to furnish the particular information with reference to the industry and with that at hand I believe that it could be of very great help in the formation of an act which would stand some chance of passing in the various states, particularly if it had your backing when introduced into the legislatures.

This whole question of uniformity of state taxation is much more difficult than the question of federal taxation. That is bad enough for those who have to come in contact with it but at least you can focus pressure upon Congress, when some grave injustice as in the taxation of capital develops, with some hope

of bringing relief. It is such slow work to do anything in the various state legislatures where each legislature is enforced by an act which has not been repealed in some other state. If you gentlemen can get a uniform act prepared by the National Conference, with its recommendation before the legislatures, you will at least avoid that which has defeated so much business legislation in the past, namely, the charge that the proposed tax change is in the interest of some special interest or industry at the expense of the people. The Conference at least has the history and reputation of only recommending to the legislatures of the country those acts which in its judgment are for the benefit of the entire country without regard to any particular or special interest. I can assure you that if there is anything I can do personally as an officer of that conference in assisting in ironing out the inequality of taxation in the field of mining or anywhere else, I shall be glad to assist. (Applause.)

CHAIRMAN ARMITAGE: Gentlemen, I think I express the sentiment of this meeting in thanking General MacChesney for his interesting talk and his offer of assistance. I can assure him that if the conference here adopts some plan or program that we shall certainly consult his organization and call upon them for assistance, if not actually to advocate the laws that we may decide upon.

Mr. Albert Fay, who is the Chief of the Sub-division of Natural Resources of the Income Tax Unit of the United States Bureau of Internal Revenue, was to be here and deliver an address on the relations of the Sub-division of Natural Resources to the mining industry. Unfortunately, Mr. Fay's subdivision was engaged in a reorganization and moving from one building in Washington to another. He was doubtful at the last moment if he could attend and I am sorry to say he has not appeared as yet. I am afraid he will not be able to attend the meeting.

We have with us a gentleman who has been a Solicitor of the Internal Revenue and who is familiar with the needs and requirements of the mining industries and who has given particular attention to the subject of tax, both from Governmental and State standpoints—that man is Major Robert Miller. I will call upon him to address the conference. (Applause.)

MAJOR ROBERT N. MILLER: Gentlemen, I enjoyed very much and profited very much from what I have just heard and I expect to learn a great deal more while I am here; in fact, to get more than I am able by any possibility to give. What I have to say is primarily on the subject of federal taxation and it does not fit in, I am sorry to say, exactly with what Mr. MacChesney has said.

Before I begin, I want to say there is a very firm conviction of mine that the movement toward uniform state taxation is a

very important one. All of us have seen how pitifully foreign states are handicapped by the difficulty people have in moving back and forth, the duties and the changes of language and everything like that. I have realized what a vast blessing it is for us in this country that we can move around and forget when we cross the state line. What a splendid thing that is for our country. We have been handicapped by something that was nearly as bad as some of the foreign difficulties, and that is this utter diversity of laws and notions about all kinds of things. This is a step in the direction of wiping out that handicap. Laws can be uniform and still they can be bad. They can be uniformly bad as well as uniformly good, yet I am very firmly persuaded that with uniformity goes education of the fundamentals that are involved in any kind of tax laws. With education goes a movement on a sound basis of theory of the law. If this movement is started now and it takes 15 years to fruit in a reasonable number of uniform state tax laws on mining, it still is worth while to start now. The good results of starting now will begin to be evident right off because primarily the trouble is that the state laws are so diversified and the reason why they are so often poor in theory is a lack of understanding of the fundamentals and good sense of the thing. The more the matter is talked about, the more people meet together, the more they will get at that fundamental good sense of the proposition.

In taxation we have got to face the fact that uniformity is harder because taxes are like other laws, they are necessary evils to a certain extent. It is a pity we have to have anything to govern us. Fundamentally, it has a beneficial influence but a tax law just to raise money in that sense is a matter of necessity. In most cases it has to be met with materials that are at hand. This is a hard problem but the fact that a problem is hard never yet stopped the right kind of people from going at it and working it out.

One other point about this state proposition which I think we shall see more and more, is the growth of the idea that somehow or other a man doesn't have a right by natural resources. They think if he has paid a million for natural resources he has bought something people have no right to trade in. That is wrong. It is something that has got to be gotten out of people's heads. There is one other thing that has to be fought. There is a natural restraint on the taxing power even when it is directed against a small class. If the people of the taxing sovereignty need the product, after they have gone a certain way in taxing a small group, they begin to wake up and find the supply of what they need is falling off. In the case of natural resources, there is lacking the control of that influence which usually evens things up.

With Reference to the Administration of Federal Income Taxes

When the federal tax administration takes the position that more income or excess profits tax is due from a taxpayer than has been paid for any particular year, there are three possibilities—the Government may be right, the taxpayer may be right, or neither may be right. The Government has a valuable background gained in the study of other cases, but is sometimes handicapped by lack of detailed knowledge as to the particular case and other disabilities due to the size of its organization. The taxpayer, on the other hand, has unique knowledge of his own business, but often lacks full understanding of the legal effect of the facts when considered in the light of the conventional rules which experience has developed in the Bureau. He often fails to realize that some of the facts are material on the tax questions. No satisfactory solution can be reached until some combination of experience can be made by which each group will get the knowledge which it needs, and furnish the knowledge in which it is proficient. It is unfortunate that the law should be so complicated to administer, but it is nevertheless true. It is a fact that any heavy income tax law is complicated, for the accurate determination of net income is inherently hard. We have not only an income tax law, but also a law involving invested capital—another source of complication. There appears to be no chance of getting rid of the excess profits complications in the returns to be filed next Spring.

Since the decision of these questions in any tax case lies primarily with the Government, it is the taxpayer who must take the initiative, and bring the Government to his way of thinking if he can. That this burden falls on the taxpayer rather than the Government is unfortunate, but here, too, we must deal with this as a fact. It must be admitted, also, that in taxing systems, both present and past, it has practically always been the same.

It is perhaps profitable to consider a few of the principal difficulties which harass the Government in the tremendous task of auditing millions of returns. The taxpayer has always known it was hard for the taxpayer, now he is beginning to realize that the Commissioner of Internal Revenue is in no easier position. The best reason for studying the problems of the Department is that such study is helpful to the taxpayer in presenting his case. To understand the difficulties which must be removed before a judicial body can be convinced, is obviously the first step toward actually and legitimately convincing.

1. Probably the greatest difficulty which confronts the Commissioner is the fact that he is not free to pay the salaries appropriate to the responsible and difficult work his technical assistants and deputies must do. All of the Secretaries of the Treasury and Commissioners of Internal Revenue who have held office since heavy taxes made this a vital issue, including the present

officers, have fought for better salaries for the men who must supervise this difficult technical work. Some success has been met with, but the taxpayer is still suffering from this difficulty. Inexperienced men are of course slow, but this is not the most serious thing; inexperienced men, who have not a clear background, based on the examination of many cases, nearly always lack the courage to decide for the taxpayer when he ought to have the decision. The seasoned man has the courage of well grounded convictions. The men of this type who are still with the Bureau are fully able to guard it from imposition, but also able to yield when the taxpayer is right. They cannot be spared, and they are the very ones who are most in demand for outside work. Unless these key men are paid what they are worth, things are likely to grow worse in the Bureau instead of better.

2. The next difficulty in point of importance is the complication of the law. So long as the law is complicated, its administration will be and the impending legislation, except as to the taxable year 1922 and thereafter, offers no substantial simplification. Taxpayers do not need to be reminded that the law is complicated, of course, but the undue stress which is often laid by them on some special phase of the law seems to indicate that many do not clearly see how wide a field must be covered before one can really say that a tax is correct, and if not, where the trouble lies. Human nature acts much as it does in relation to medical treatment. Just as patients who hear that someone has been benefited by a certain treatment, want to have the same treatment without reference to whether the disease is the same, so some taxpayers, because a depletion adjustment or a change of depreciation basis has helped someone else, assume that this is the point as to which their own returns need attention. The fact is that no one can tell without fundamental study what, if anything, needs attention in a particular case, and that this complexity is the biggest practical difficulty in administration.

The great number of questions which have to be settled before the Government or a taxpayer can tell whether a tax is right or wrong might be classified roughly into four groups:

(a) General questions relating to determination of net income for the taxable year.
(b) General questions relating to determination of invested capital for the taxable year.
(c) Valuation questions.
(d) Application of relief provisions.

The first—as to income determination—embraces a great number of widely diverse problems such as what must be included in gross income, and in what year; what constitutes realization; deduction problems, including those relative to depreciation; depletion, losses, amortization and the like.

The second class-invested capital question—involves such topics as reconstruction of items which could have been charged to capital account, but have been expensed, the establishment of values paid in for stock, questions as to diminution of invested capital through sustained depreciation and depletion, the subject of inadmissibles, etc.

The third class, that relative to valuation, is closely related to the first two, since the valuations are for the purpose of affecting either deductions used in determining not income or for the purpose of sustaining claims for invested capital, when property was paid in for stock. Valuations are an important feature for taxpayers in general, but are especially involved in the tax matters of wasting industries, because in addition to the other questions depletion deductions appear as an important element. Everyone who has dealt with valuations—whether for state or federal purposes, or rate-making or what not—will readily agree that few things are harder or less certain. In the case of natural resources, it is surprising that although it is seven or more years since depletion began to be a factor in federal taxation, and although it is an important and annually recurring factor, the problem as to what bases are best for such valuations for that purpose is still not fully worked out. In some of the lines, such as coal, metals, oil and gas, a great deal of constructive work has been done and is still going forward, but in the field of miscellaneous non-metals, such as, for instance, asphalt, gypsum, mica, asbestos, feldspar, graphite, phosphate rock, potash, salt, etc., the greater part of the constructive work is still to be done. In this difficult field, as in the whole taxation field, the answer lies not primarily in what some one authority thinks as to the value, but in the detailed facts. Accounts, engineering facts and law all play a part in the valuation of material deposits, and the ideal engineer's report on a valuation is one that not only sets for the conclusion of a qualified person, but presents such facts so marshaled that if no conclusion had been expressed, a well qualified reader following the report through will be led in his own calculations to reach the conclusion which the engineer had reached. The ipse dixit counts some, but the reliable and well ordered facts, which in common sense affect the value are most useful of all.

As you gentlemen are well aware, the Bureau has from the first recognized the importance of the valuation problems, and has not only established valuation divisions for natural resources and for those industries entitled to amortization, but has subdivided these divisions so as to employ and develop experts in each field of valuation.

The relief group, referred to as the fourth of the general heads, includes the cases in which the Commissioner has power, after the correct technical calculation of the excess profits tax, to reduce it to a figure in line with the percentage of net income

which more normal competitors have paid out in excess profits tax. The particular abnormalities on which such relief rests will not be discussed here. As bearing on the complication of the law, it is to be noted that many of these abnormalities relate to facts which books of account are not expected to indicate—which must be obtained by observation of the business itself, and careful inquiry as to its conduct, and the causes of its success.

3. In addition to the complication of the law itself, a very grave difficulty lies in the problem determining the facts to which the law is to be applied in the case of each taxpayer. It goes without saying that the natural inclination of a busy administrative officer is to apply the general rule—especially when it reaches the conservative result of increasing the tax due the Government. It is natural that any facts which bring the case under one of the rule's exceptions will be closely scrutinized, and to be accepted, must be fully substantiated. The determination of facts is difficult enough when both sides have equal access to the facts and opportunity to study them; it is harder still where, as in the tax questions, presentation is largely ex parte. The Bureau not only deals with the average taxpayer, who uses language honestly, and means what he says, but with some who are not so frank, and who deal in half truth, or worse. For instance, the taxpayer must remember that while "approximately" is a respectable word, and has a real meaning to him, it is a word to keep away from, because less scrupulous persons have made the Bureau auditor regard it as a cloak for misleading statements. This is trivial, yet it illustrates a general truth—how careful the auditor is made by experience. Generalities he hears every day, so that they make no more impression on him than the familiar ticking of a clock. He does not begin to listen until clear and well authenticated facts, given in circumstantial detail, begin to appear, and you would feel the same way if you had his job. When you come to think about it, it is his duty to watch the Government's side of the case, as well as the taxpayer's. Sometimes, it is true, he grows suspicious of everybody, and acquires a state of mind in which nothing can convince him. Such conduct is not the rule, and is of course indefensible; the only treatment when it is met with is to go higher.

The ordinary taxpayer has somehow inherited the idea that things in Washington go by influence. This may be true in some quarters but it has not been true of the tax administration since it has become so vital a part of the nation's fundamental structure. It demands and receives a leadership of unusual quality. This was true under democratic rule, and is true now. No governmental agency is less political or more earnest. It claims the attention of sober and thoughtful men, and its responsibilities make them more sober and thoughtful still.

It is not easy to employ thousands of men in a work which

requires un unusual degree of judgment as well as high technical accuracy, but since the tax laws first became complex the men responsible for administration have tried their best to build an organization which will develop the right answer for each taxpayer.

And yet—as these gentlemen freely admit—no amount of faithful endeavor has served to make the taxpayer's lot even bearable. Entirely aside from the money he must pay in taxes, endless delays and readjustments occur which are soul-wearing to him and unfortunate for the Government. The point is that these conditions are not due to lack of effort to correct them or lack of effort to get the men who can correct them. The Commissioner must enforce the law Congress enacts; Congress must enact the kind of law which the tremendous demand for tax revenue makes imperative, and no hope of really simple administration is in sight until the amount to be raised in taxes can be reduced. But it is important for taxpayers to bear in mind, I think, that the solution of these difficult problems depends on a fuller understanding of the whole problem by both parties, and that the Department welcomes and always has welcomed the co-operation of taxpayers in getting at the truth. If you say that you have met a revenue agent who is a plain tax-grabber, or some other official who seemed to think that the taxpayer had no right to have any ideas on so distinctly federal a science, my answer is that you ought to know better than to accept the word of such a man as final. It is indeed a shocking thing that it takes so much time and patience and so many trips to Washington, but we have to admit that since the dawn of civilization man has never invented a single satisfactory method of settling any kind of technical controversies involving large issues without difficult, hard work and delay. Patience and hard work have always been required, and if there is a royal road, no one has ever found it.

4. Another difficulty is that all taxpayers must be treated alike in principle, and that the principle which helps one taxpayer often hurts another. If a point of principle hitherto adopted is yielded because its application would result in hardship in a particular group of cases, it means that this principle is wiped out permanently. It is either sound or not sound. From this it is clear that a taxpayer's contention has a better chance of succeeding if it can be reconciled with principles to which the Bureau has been committed, because while established principles must be overturned when necessary, such action may require a reaudit of many cases closed on the former basis, and introduces an element of uncertainty which is sometimes as bad in its total effect as adhering to the old rule would have been.

5. There is another factor which might be mentioned, but which as a practical matter is not as important as some people think. It is a fact in this organization, as in any other where

many employes have great responsibilities, that moral breakdowns occur, but I am glad to say that the importance of this is often exaggerated. While this is a thing which must be and is watched for and guarded against, the tax administration is one of the cleanest large organizations in the world. Instances of moral failure, when they occur, are startling and disquieting, but they are very exceptional. The Bureau may agree with the taxpayer, or—more commonly—disagree with him, but it is fundamentally an honest place and the disagreements and agreements are honest. The men naturally resent any action on the part of a taxpayer which indicates an impression that influence can produce a result which facts and arguments cannot.

Taxpayers who must help the Government perform its difficult and important function would do well to observe three cardinal rules—to which I think the Commissioner and all his cohorts would cheerfully subscribe:

1. To treat the representatives of the tax administration as men who are honestly seeking the right answer to a hard problem.

2. To avoid assuming that any government tax man who seems churlish or intolerant is typical of the organization, and to realize that there are always men who will listen with courtesy and sympathy to a real case clearly stated, no matter who presents it.

3. To present the detailed facts and the law of the case, fundamentally considered, in written form which will permanently justify the ruling expected, and, if possible, on a ground which does not require the upsetting of rules adopted in other cases.

CHAIRMAN ARMITAGE: Major Miller's discussion of the subject of federal taxation was of special interest, particularly with reference to the administration of federal taxation. The same problems of administration of taxation systems apply in the states. The same difficulty of getting proper men, of keeping proper men, preserving the personnel of the tax bureau and commission, and keeping a high standard exists in the states. It is through Major Miller's long experience with those particular problems in Washington that his discussion of these things bear on the subject of our state tax problems. That is one of the problems that we will have to face. It has been stated that nine-tenths of the tax law's success depends on its administration. There is a great deal of force in that statement.

Major Miller pointed out and gave us a new thought on the subject of state taxation, particularly as applied to mines, that is in the case of mine taxes that we did not have that natural restraint which existed where the people of the locality consumed the product. That is a very interesting thought. You can see plainly that where the product is consumed by the people and is overtaxed, people of the locality feel the effect of high taxes. Where the product is consumed nationwide they don't feel that

effect and we don't have a constraint. That is one of the things which differentiates and separates the taxation of mines from other industries of the state.

I think we can approach this subject of state taxation best by having a discussion of the different systems of the different states in the taxation of mines. They may be roughly divided into some form of income tax and some form of ad valorem tax. In some states we have the net production, the gross production, or a combination of the two taxes and in others the valuation tax based upon a valuation of the mines. One of the states has made a most determined, conscientious, and fair effort to solve this problem of tax. New Mexico appointed recently a commission to discuss the question of taxes and report to the government of that state.

The members of that commission, of which Mr. Hagerman was chairman and Professor Haig of Columbia was special advisor, had many hearings and issues. In November of last year, a report which is a very interesting one and a very carefully prepared and carefully thought out document was made. Part of that report deals with the question of taxation of mines. It is a most interesting chapter. The commission seemed to be in favor of the ad valorem method. One of their suggestions is a very interesting one. They suggested that there should be a suspension fund in the type of an insurance fund which should guarantee in a sense the assessor's valuation. This fund was to be paid in to the state and as the assessor's valuation should be collected that fund should be used to pay subsequent taxes if the valuation was excessive. Now one of the men who attended those sessions and who is familiar with the problems that they tackled and the attempt of the state to solve those problems, is present and that man is Judge Stimson. I would like to call upon Judge Stimson to give us his experiences with reference to tax matters and methods of taxation of mines in the state of Colorado with which he is familiar also.

JUDGE E. C. STIMSON: Mr. Chairman and gentlemen, this is almost embarrassing. There are gentlemen here from New Mexico who are much more familiar with the New Mexico situation than I could possibly be, for I was almost an interloper and intruder. I was present at the meeting of the mine operators at Silver City, when the matter was first presented for their consideration. I was present afterwards at the session of the commission to which the Chairman has referred, at Santa Fe when they gave the mining interests a part of one day for a hearing. Professor Haig was there; he asked very few questions and said very little. His conclusions appeared, I suppose, in the report of the commission to which reference has here been made.

We all understand, I think, that the whole system of taxation

was voiced in the remark of that pretty wise old man of many, many generations ago, that it was an endeavor to get the most feathers from the goose with the least squawking. That seems to be the earnest endeavor of those who are trying to work out some simple and easy plan by which the expenses of our government can be paid, getting the money from the sources where the least complaint will arise.

I was extremely interested in the suggestion that was made that we taxpayers should treat the governmental agents as honest men. I'd like to pass back the suggestion that it would be a mighty fine idea if the governmental agents treated the taxpayer as if he were an honest man. (Applause.) Most of us are perfectly willing to perform our civic duty even though it be at some sacrifice to ourselves. Most of us are anxious to bear the burden of citizenship and bear it properly and bravely and honestly and we don't want any sympathy from anybody in the performance of our duty, for we recognize it as an existing thing and we are more than glad to respond to any reasonable demand that may be made upon us, but we want to be treated fair and be handled at least with as much consideration as is received by others in the same situation.

I have no apology to make for the mining industry with which I have been pretty familiar for something like 40 years. I realize the burdens that have been laid on it. It isn't so much hostility to the mining industry as it is anxiety of other industries.

When we met at Silver City we found (and it later developed at the meeting in Santa Fe when the commission was in session), the real trouble was that there seemed to be large areas of territory of the state of New Mexico which bore no burden of taxation at all. The real complaint there was addressed against the coal mining industry. Some of those operators occupied enormous tracts, hundreds of thousands of acres of ground under agricultural working. In New Mexico, then under the existing law, they paid tax on that entire holding based on the production of the small area from which they were actually mining coal, with a valuation on the surface as grazing land or something of that sort That had been, primarily, the great trouble in New Mexico. They sought what they called a valuation of the mining property. They talked a lot about an ad valorem tax but it very soon developed that they didn't know what ad valorem meant.

Some of us took the position that every dollar that is taken out of a mine, metalliferous or coal or non-metal, in the first instance is a depreciation of the capital. It is a taking away of the substance of the estate, it is not income, it is a return of the capital investment and it should not be treated as income. It is not available in that sense. Some of us felt that very strongly and some of us took the position which I am prepared to define reasonably, that a mine is worth nothing under God's heaven

except for what you take out of it. The value of your mine this year is what you take out of the mine this year, and the value of the mine next year is what you take out of it next year. That did not meet with the approval of this special commission. The thing was thrashed out very extensively, not exactly along that line, but with those considerations being urged as matters really affecting the ultimate situation.

The commission made its report to the governor and the legislature. A bill was drafted. A substitute bill was prepared and submitted by the committee of the legislature which had the matter in charge and that bill was enacted into a law in 1921. It doesn't appear on the summary which Mr. Kriegh prepared and which is here, because he did not have it available when he prepared that summary. They came back to the idea, finally, in New Mexico, that the value of a mine is what is taken out of it.

I have said on previous occasions something which I would like to repeat right here. The difference between a farm and a mine is, as a friend of mine says who had been engaged largely in mining enterprises in all phases, and who after a long time begun to run a sugar factory—much to his unhappiness afterwards—the difference between a mine and a sugar factory or an agricultural enterprise of any sort is that in the agricultural enterprise he found that he ran that sugar mill very much as he did a mine for the extraction of ore but the ore reserves on a farm are renewed every year and the ore reserves of a mine are not renewed at all, for once taken out they are gone forever.

So finally the New Mexico legislature enacted a law that the average net production of a mine for 5 years shall be taken as the value of the mine for taxing purposes. In addition to that—if I am not right on this, one of the New Mexico gentlemen will correct me—the equipment and the plant is valued as other property is valued and in addition to that there is a valuation placed on the use of the property not actually devoted to mining to the extent that that also has a value. So those are the three elements which now enter into it, substantially as the situation was before, except that they have taken five years' production and averaged it in order to reach the present year's valuation. That is going to hit some of us who are interested in New Mexico mining because we are doing nothing this year and if we have to take the production of 1916, 1917, 1918, etc., when we were producing rather heavily, it will make a high tax for us.

In addition to that, provision was made in the New Mexico law for the apopintment of a special examining engineer; and under that provision a very high class man, Mr. Findlay, who had much to do with the administration of the Michigan tax law, is now engaged in a very earnest endeavor to reach a fair statement of the actual values in order to aid the state tax commission of New Mexico in adjusting things if it should turn out

that this other system of valuation shall not appear to be entirely fair.

It happens that I am more familiar with the Colorado situation than with the New Mexico situation. For a number of years after Colorado was admitted to the union, mines as such were not taxed. It was felt that the industry of the state should be encouraged and the industry then hadn't got old enough to be weaned, to use Champ Clark's expression. The mines of Colorado were divided into two classes. The coal mines, I may say, are taxed regardless of this metal mining tax. Their taxation is based on an estimated value which is made by the various assessors under the direction of the tax commission. There never has been any question raised, particularly by those people. The valuation value always has been, at least, satisfactory to the coal mines.

Metal mines are divided into two classes: the productive and non-productive. A group of mining claims operated as one mine is called a mine. The surface improvements, equipment and everything of that sort are valued by the assessor just as household furniture or any other articles in his jurisdiction are valued.

A mine which produces less than $5,000 net in a year is a non-productive mine and is valued according to the judgment of the taxing authorities, but in no case at a higher valuation than the producing mine in the same locality. The producing mine is taxed on a valuation of its net output. The net output is the actual net value of the ore after deducting the actual mining expense but not general supervision, not the salaries of general officers, not big overhead, but just the actual cost of the production, unless that is less than one-fourth of the gross. That is a queer provision. They figure a man ought to make 25 per cent on his operations. The taxing officer takes the return that is made, finds out what the gross value is, finds the net, divides the gross value by 4 and uses either one of them, whichever is higher. That is about the way it works out.

There have been a great many people who assisted in the mining development of Colorado, and that development has been anything but equal to the agriculture interests of the state. The farmers have sometimes felt that the miners were getting a little the best of it. They have not approached the matter with an entire earnestness of purpose to secure absolute fairness perhaps, but they so far have not succeeded in materially changing this law which has been in force with us for years and which declares in substance that the value of a piece of mining property is what is taken out of the ground. That is what it is worth. After it is taken out of the ground it appears in other investments and is added to the wealth of the country; it is taxed as wealth of the country is taxed; it becomes a part of the real property of the country but at that particular time the only value

that a mine has, in our estimation, is what we can get out of it. We have a provision—of course all states have that—that all properties shall be valued for assessment and taxation at its full cash value. I have urged and shall continue to urge until my mind is changed, that a fair cash value is just what I can get out of it, not what I estimate it to be worth in the future, not what I imagine I can get out of it years to come, but its actual worth I can get for it, what I can spend.

There was an expression used in a decision of a lawsuit in the state of Washington not so many years ago which rather interested me. A man was held accountable as a trustee for certain investments and he had reported the ownership of certain stock in a mine as being $10,000. He was therefore asked to account for $10,000 in cash. The judge wiped that all out by saying, "We all understand that the valuation of a mine in the estimation of the owner is a capitalization of his hopes and dreams."

Now there is one thing I want to speak about. Some gentleman suggested to me when the matter of uniformity of state taxation was presented, that the first thing we have got to get is uniform state constitution before we can have uniform state laws. Here is a practical difficulty that suggests itself to me in that direction. I want you to think about this. In many states (you have heard about one of them), the valuation for taxation purposes is fixed at 30, 40 or 50 per cent. of the estimated value of the property. In other states, it is the full valuation of the property; it is so in my state. Now, you have got to begin further back than that in your endeavor for uniformity of taxation because I don't hesitate to say there's not as great discrimination in the rates of tax in two different states as there is in other costs of production of the minerals from the ground. The wages paid in Montana are different from those paid in Colorado; in Arizona they are different from both of them, and all of them are different from the wages paid in the mines of New York state where there is some mining going on although very few of us know about it.

The burden laid on the producer by his various costs of production is not limited to taxation and while taxation is an important feature there are certain other elements which are of equal importance. I wasn't asked to discuss that now but what I was trying to do in the first place was to give an idea of the notion that prevails in some of the western states at least about the valuation of metal mining property for taxation purposes. The net value of the product of a mine is written in the constitution of the state of Montana, a difficulty which will have to be met if there is to be any such uniformity as this. This is to give you gentlemen a notion of what some of us in the West think about and have thought about the value for assessment for a piece of mining property which is in operation and from which people are trying to make some money for themselves

naturally because that was what induced them to get into the game. (Applause.)

CHAIRMAN ARMITAGE: Is there a gentleman present familiar with the tax in the mines of New Mexico who would like to add or comment on the statement of Judge Stimson? We would be glad to hear from them on the subject of New Mexico mine tax laws.

MR. BURTON BUNCH (Silver City, N. M.): I want to thank Judge Stimson for making it possible for me to say I am usually one of the most lucky men in the country. I thought I might have to say something and the Judge covered the situation perfectly with regard to New Mexico. He went thoroughly into the New Mexico law.

I would like to suggest, if the crowd is interested, that I have prepared copies of the mine tax provisions of the new revenue code of New Mexico for distribution at tomorrow's session. If you are interested, I will have them on the table for you.

CHAIRMAN ARMITAGE: Judge Stimson referred to the law of Montana. There is present here Mr. Dan Kelly, a lawyer in Montana, who has been associated with the Anaconda Company and who has had occasion to tackle mine problems there. I would like Mr. Kelly to explain to you the method of taxation of mines in the state of Montana and the peculiar problems confronted there.

MR. D. M. KELLY: Representing the Anaconda Copper Mining Company we very naturally have a great deal to do with mine taxes in the state of Montana. As suggested by Judge Stimson, we have a constitutional provision which was written in the constitution at the time of its adoption which specifies a particular method for the assessment of mines in Montana. The first provision is that the property is assessed at the price paid the government, either $2.50 an acre or $5 an acre, depending on the manner in which it was secured. All machinery and equipment and improvements on mines are taxed as other property, in addition to that, if the surface of the mining claim has any value independent of its value for mining purposes, if it is used for any other purpose, it is taxed at that value. To illustrate that, the entire city of Butte is on patented mining land and the town property there is taxed on the basis of front footage just the same as it would be if it were on other types of patented land, and the owner of the mineral rights pays $5 an acre on surface valuation in addition to the tax the resident owners pay for the surface rights they have. The machinery and equipment at the mine is taxed like other property of like character. The net proceeds of mines are taxed annually as other property is taxed.

Two years ago we had a report of a temporary tax commission appointed by the legislature of two years previous and they recommended and there was adopted a classification law in the

state of Montana providing in substance that all property is originally valued at its full cash value. Theoretically, that was always the law. Then the property is classified for the purpose of determining the value upon which the taxes will be figured; proceeds of mines 100 per cent., real estate 33⅓ per cent., machinery and other equipment 40 per cent., banks 40 per cent., money credits 7 per cent. and household furniture 20 per cent. I believe, so that the average of all property in Montana, as it has worked out, is a tax on a little bit over 30 per cent. of the actual value, whereas, the proceeds of the mines are taxed on 100 per cent. That gets us in about the same position that Utah is in. I believe they have a proceeds tax where they multiply by three. The same result is found in Montana.

That law, this year, was amended but not to change it fundamentally. The reports of the mining companies instead of going to the local assessors, go to the state board and the taxes are figured and levied by the State Board of Equalization. This system of taxation has been added to by the last legislature which provides a visual tax of 1½ per cent. on metalliferous mines. We have in addition to that, 10 cents on coal. That has worked out in Montana so that with the additional 1 per cent. corporation tax, which the mining companies as well as other corporations have to pay, in one year, for example, the Anaconda Copper Mining Company paid $20.13 out of every $100 that went into the treasury of the state of Montana—a state nearly 700 miles long and nearly 400 miles wide, which has three trans-continental railroads and other railroads and power companies operating, as well as our agricultural and merchandising institutions.

Now it was suggested by the Chairman at the opening of the meeting that uniform system of taxation would be helpful. I have no doubt that any system of taxation that can be uniform would be helpful. It doesn't follow that because you get a uniform law you would get uniform taxes. I don't think either that if you had a uniform charge per pound against copper, zinc or other metal that it would necessarily follow that taxation would be uniform. I can conceive, for example, that there might be a mine in Arizona, Utah, New Mexico or elsewhere that had one hundred million pounds of copper in it which could be produced and would cost 10 or 11 cents a pound and there might be eleven hundred million pounds left in that mine. Now the levy of a tax should be based on the value of the eleven hundred million pounds of copper that can be mined at 8 cents a pound. That copper is worth more money in the Butte hills even if mined at 15 cents a pound. If the tax on the copper in Montana was 1 cent a pound and you had a uniform tax law, the charge of taxation against the production of copper throughout the country would be necessarily unfair and would discriminate against the owner of the mine who had the

same amounts of copper in his mines but the cost of production would necessarily mean fifty or one hundred per cent. more. I don't believe myself in writing a statute uniformly, putting the same language in a statute and having it adopted by the legislatures throughout the country that will not necessarily result in uniformity of tax burden. You say it applies to mines rather than to real estate of other types. The mining industry of Montana is bearing a larger burden than the mining industry of Colorado. It is my judgment that the valuation of mines and the methods of taxation are such, both from constitutional provisions and from history and development of states and from different types of industry and its relation to other industry of the same state, that uniformity of statutory enactment doesn't mean uniformity of taxation at all. If I were to make an examination of taxes in different states, those states which had the highest production probably would have the highest charges because of the inequities of administration of tax laws generally.

Mr. FENNEL: What are net proceeds?

MR. KELLY: Net proceeds is the gross value of the ores that you take out less a certain portion of the cost of getting them out. It is just an arbitrary figure. It is arrived at this way. In Montana you get your gross return, if you own your smelter, you just take it from your sales of copper and if you sell during this year one hundred million or fifty million dollars worth of metal you are entitled to deduct from that your smelting cost, your transportation from the mine to the smelter, the actual cost of mining the ore and hoisting it to the surface and loading it. None of your overhead goes in, none of your tax, none of your employees' expenses or other overhead, and no depreciation.

Our mine tax law was amended this year, providing for an allowance of 6 per cent. investment in smelters where the mine operator owns his own smelter because of the fact that his smelter was naturally depreciating and he wasn't getting allowance on that. I may say the net proceeds system is used in Montana, Idaho, Utah, Colorado, Nevada and New Mexico, I think. The system is difficult in Arizona where the net proceeds is an arbitrary figure arrived at by subtracting from the transportation your smelting charge without any allowance for overhead or depreciation at all.

CHAIRMAN ARMITAGE: Mr. Kelly, have you any figures that would tell us about how much per pound of copper the tax amounted to?

MR. KELLY: I have some data in my grip. I'll look it up. I have some pamphlets of an address made by Mr. Kelly, president of our company, and Mr. Evans, chief counsel. I'll be glad to furnish you with them. They have a number of figures in them, whether they will give that information I cannot say.

MR. KRIEGH: Hasn't the Montana system been changed recently by a court decision affecting mineral rights?

MR. KELLY: No, not with reference to the taxation of mines. You have reference to the taxation of mineral reservations.

The Northern Pacific Railroad Company had a large land grant in Montana. In the sale of lands they reserved the mineral rights. After having disposed of the entire surface, they took the position that since mines were taxed upon their net proceeds and their surface improvements, this mineral right which they reserved was exempt from taxation. The court sustained the right of taxation because the Northern Pacific Railroad Company in the reservation of the minerals under the ground reserved the right to enter upon the ground and mine it.

CHAIRMAN ARMITAGE: Has there been any investigation of the subject of mine taxation in an official way in the state of Montana?

MR. KELLY: This tax commission, as I said, had the entire tax situation to investigate and report on. They made their report to the legislature two years ago. They recommended to the tax commission the tax classification law and some other minor changes and they left the mine tax system, after investigation, as it was. They made no further recommendations with reference to a change in the general system of mine taxation. A great deal, of course, may be said with reference to this mine taxation. I will not say that now.

CHAIRMAN ARMITAGE: I don't know whether I quite understood your statement about the multiplication of three.

MR. KELLY: You get the same result as if you taxed the property all at the same amount. We pay three times as much taxes on the same valuation as the fellow does who is assessed at 33⅓ per cent. If your net proceeds are a million dollars, you are assessed on one million dollars. If a merchant turns in one hundred thousand dollars worth of merchandise he is assessed on thirty-three thousand dollars worth, so that the mine proceeds are taxed three times as much as the merchandise or the farm or other proceeds.

CHAIRMAN ARMITAGE: Do they take the net proceeds of the year?

MR. KELLY: Of the year on an average. That has its advantage from the standpoint of the state. You have your good years and bad years. The result is that they spend all the money they get in good years and when the bad years come along they are in bad shape. Men who run government are not usually business men. It would be a good idea to spread the money around. Mine operators wouldn't like to pay at this time on the last five years' production when we don't have any now.

CHAIRMAN ARMITAGE: I would like to ask Judge Stimson a question about New Mexico. I think he said they use an average there as a basis.

JUDGE STIMSON: Five years.

CHAIRMAN ARMITAGE: What do they do when one of those years is a blank.

JUDGE STIMSON: Still divide it by five.

As Mr. Kelly suggested, that is going to work pretty hard this year because we have no production, or practically no production this year and the five years previous were good years.

CHAIRMAN ARMITAGE: Is there any gentleman present who wants to add to Mr. Kelly's statement?

Gentlemen, it is now half past four. We have set for this meeting tomorrow morning at 10 o'clock a series of discussions by various state representatives on the local methods of taxation in those states. We will continue that meeting as long as you want to, even into the afternoon if you so desire. That will be the real meeting at which you will have an opportunity to discuss the different methods of taxation which are in vogue in the various states and the effects of those various methods.

The meeting adjourned at 4:30 p. m.

SECOND SESSION

WEDNESDAY MORNING, OCTOBER 19, 1921

The second session of the National Tax Conference convened at 10:10 o'clock, Mr. Paul Armitage presiding.

CHAIRMAN ARMITAGE: Gentlemen, will the meeting please come to order?

Mr. Kriegh has a statement to make.

SECRETARY KRIEGH: Mr. Chairman and Gentlemen: I was very much pleased with the statement made by Judge Stimson yesterday that the mining industry isn't endeavoring to escape bearing its just proportion of the tax burden. I think that is the feeling of every member engaged in the industry. I thought, however, after discussing the matter last evening with several of the delegates, that it would be well to define the purposes of this Conference a little more definitely so that our ideas will be directed into a definite channel.

The keynote of this Convention was sounded yesterday by President Loring, in a luncheon of the Directors of the American Mining Congress, when he said that the purpose of this Convention is the conservation of our natural resources by the elimination of waste and inefficiency in mining wherever waste and inefficiency are found.

The greatest waste that is going on today in the mining industry is that resulting from the total loss of enormous tonnages of ore which could be mined at a profit simultaneously with the extraction of high-grade ores if it were not for high taxes. It may be impossible to secure uniform tax laws. We must not anticipate the early accomplishment of such a program but what we can do and do at once is ascertain and publish facts which will enable the state legislatures to act intelligently at least when revenue legislation affecting mines and mineral land is being considered. We can demonstrate at this meeting the fact that there is a maximum rate of taxation beyond which taxes cannot be raised without serious impairment and gross wastage of the nation's natural wealth. We can establish without doubt the fact that increased taxes in many of the states, instead of augmenting state revenues, actually reduce the volume of taxable property, make valueless rock of an enormous tonnage of ore and thus destroy forever present and potential sources of revenue.

That, gentlemen, is the purpose of this Conference, to bring before the public the facts concerning the taxation of the mining industry.

CHAIRMAN ARMITAGE: Mr. Kelly has given us copies of the address of Mr. L. O. Evans that he referred to in his address yesterday and they are here for any of you gentlemen

that are interested. I will ask Mr. Kriegh to distribute them

Now before we continue the discussion in reference to state taxation, I wish to call upon a representative from Mexico. It seems that the Secretary of Industry of Mexico has appointed a special delegate to this Convention. He has been approved and commissioned by President Obregon to come here and explain to us the laws of Mexico in reference to the taxation of mines, and with your permission I will interrupt the discussion of state taxation to call on Mr. L. de Silva.

SENOR L. de SILVA: Mr. Chairman and Gentlemen: As a Mexican delegate I am going to give you a lecture about taxation on the mining industry in the Mexican Republic, as a mere matter of information.

I request your benevolence, and beg your pardon on account of my faulty pronunciation and for the mistakes that I make in your language that is strange to me.

The metallic wealth of Mexican subsoil has been considered, since remote times, the property of the nation, which confers to individuals the right of exploitation under certain conditions. In the colonial time the Spanish Crown had a direct dominion or control over said wealth. The mining regulations stipulated the form in which the private corporations could acquire mining concessions for their exploitation, and stated therein the amount of royalty that was to be paid to the Royal Treasury.

When New Spain seceded from the Mother Country, becoming the Mexican Republic, the old mining regulations continued in effect until the year 1884. In 1885 the new mining laws, strictly Mexican legislation, went into effect, maintaining the principle that the nation is the primitive owner of the mines and that the title is granted to the applicant by the Public Administration. The taxation assigned to the mines in Mexico is based on this principle, as well as in the equity of contributing all branches of national activity for the necessities and expenses of the Nation.

In order not to tire the benevolent attention of my hearers I shall only speak of the mining taxes in effect in recent times, this in my opinion, being of great and practical interest.

According to the Mining Tax Law, enacted June 27, 1919, there are three kinds of taxes: first, on the mining property; second, on the metals produced; and third, on smelting, assaying and coining. The first one, or tax on mining property or Mining Tax, is an annual rate paid on each mining claim unit; the mining claim unit is the *pertenencia*, say a prism of indefinite depth whose outer base is a square, 100 meters to each side (say 10,000 square meters).

A mining property may consist of one or more *pertenencias* (unit or area), without any limitation whatever; but the tax about which I am speaking, tends to limit the control of great extensions in horizontal area, by one single individual or corporation, because the annual rate per claim unit increases in

proportion to the number of *pertenencias* owned by a single individual or corporation, in the following manner:

From 1 to 5 *pertenencias* (hectareas) the annual rate per *pertenencia* is	$ 6.00
From 6 to 50 the rate is	9.00
From 50 to 100 the rate is	12.00
And over 101 *pertenencias*, the rate per *pertenencia* is	18.00

This increase of rates is applied considering the number of *pertenencias* owned by a single individual, regardless of whether they are included in one or more mining properties, and provided they are located within the jurisdiction of one Mining Agency.

A mining property under Mexican law is a group of mining *pertenencias* covered by one mining title.

The national territory is distributed among 93 mining agencies. A map of Mexican mining agencies may be seen at the Mexican booth in the Coliseum. The tax on mining property is the same regardless of the kind of metal produced. For paying this tax the year is divided into three periods: the first third is paid in January; the second third in May; and the balance of taxes for the year, in September. Should payment not be made the first month of the period but in the second, third, or fourth, there is added a penalty of 10, 15 or 50 per cent., respectively. If payment is not made within the whole period, the mining title becomes liable to be declared void, and consequently the owner loses his rights to the mining property.

In addition to the annual mining tax, another tax of 10 pesos on each *pertenencia* is paid when the title is issued.

Second: Tax on the production of metals.

The second kind of taxes is the one assessed on the production of metals; the rates vary in accordance with the kind of metal produced. Metals used in the national industry, such as in the manufacture of jewelry, gold or silver work, are exempt.

Gold bullion pays 7 per cent. on its valuation, when it is exported or sent to the mint for coinage, and 8 per cent. when it is exported as ore, concentrates, precipitates, mattes, or assay by-products; when those products contain only two grams of gold or less per ton, they are exempt.

According to said law, silver formerly paid the same tax of 7 and 8 per cent. as gold, under the same circumstances, whether in bullion, ore or products more or less treated; but the decrees of June 15, 1920, issued on account of the drop in the price of silver, which began at that time, established a tariff that is now in effect, whereby the tax rate on silver bullion gradually decreases in proportion to the fall in the price of silver; when silver bullion is quoted in New York at $1.40 or more per ounce, the rate is 12 per cent. and gradually decreases as low as 5 per cent. when the price is 60 cents or less. The rate varies from

13 per cent to 5½ per cent. as above, when silver is mixed with other substances as when only partially treated.

Later on, when the drop of the white metal was more marked, the tariff was amended by Decrees of December 24, 1920, to protect the mining industry during such a crisis. When the price was $1 or less per ounce, the rate would decrease as low as nothing, when silver was worth 60 cents or less, but maintaining the previous rates when the price per ounce exceeded $1. However, on July 20, 1921, a new decree re-established the tariff of June 15, in view of the fact that an economic readjustment of the mining industry was taking place.

When silver contained in ore or other products other than bullion does not exceed 250 grams per ton, said metal is exempt.

Regarding copper, the tax was definitely set when the law of June 27, 1919, was enacted and the rate increases in proportion with the price on this electrolytic metal, per pound, as quoted in New York. Another fact which influences the variation of tax rates is the contents of copper, whether less or more than 50 per cent., and the amount of precious metals which accompany the red metal, in the following manner:

In bullion mattes or concentrates containing more than 50 per cent. of copper and more than 300 grams of silver or 5 grams of gold per ton the rate is 60 on each 1,000 on the valuation of copper, if the price quoted in New York is 0.25 cents per pound; the rate gradually decreasing as low as 1 on 1,000 when the price is 0.10 cents or less.

Under the same circumstances, but if the contents of silver does not reach 300 grams, or 5 grams of gold per ton the highest and lowest rates, for the prices of .25 and .10 cents are the same as above, but for the intermediate prices, from .25 to .15 cents, the rates are remarkably lower.

On ore and concentrates containing 50 per cent. of copper or less, the tariff is made out under the same basis but the rates are much higher than the avoce, for the purpose of inducing a complete metallurgical treatment in Mexico, at least to obtain commercial copper. These rates gradually vary between 80 for each 1,000 when the price is 25 cents or more, and 15 for each 1,000 when the price is 13 cents. When the price is less than 13 cents the rate is the same as stated above.

The decrees of December 29, 1919, and December 23, 1920, issued on account of the drop in the price of copper, amended some of the rates, especially those on ore and concentrates, completely releasing the tax on copper when its price was less than 15 cents. In addition copper ore containing 3 per cent. or under of copper is also released.

At present lead is also released from production tax in virtue of a decree issued March 17, 1921, for the purpose of encouraging the production of silver-bearing lead.

Two per cent. on the valuation is paid on tungsten, molybdenum, manganese, graphite and quicksilver.

One per cent. on the valuation is paid on zinc, antimony and other metals not mentioned above.

The Mexican states may assess a tax on production of metals not to exceed 2 per cent. of their valuation.

The tax on smelting, assaying and coining constitutes the third mining tax. The coinage tax is assessed when the previous metals are sent to the mint for coinage purposes; gold paying ½ of 1 per cent., and silver 2 per cent. of their valuation; the smelting tax is paid when due to lack of homogeneity in the bullion it is necessary to resmelt it over again to assay with accuracy the rate is 15 cents per kilogram, when the gold does not exceed 100 thousandths; 25 cents if it exceeds this figure without reaching .945, and $3 when it exceeds the last figure. The assaying tax is paid for the analysis which is necessary to practice in order to figure out the production tax; the rate varies from $1.50 to $3 for each bar or lot of determined weight; viz., 10 kilograms for gold bars; 35 kilograms for silver bars, 10 tons for lead, copper and other metals in bars. When the weight of the bar or lot exceeds those indicated above, the assaying tax rate is a little larger.

I have just explained in a brief manner how the mining industry is taxed in Mexico. My best wish is that this information may be of some usefulness to the honorable members of this Twenty-fourth Convention of the American Mining Congress. I regret that the short time at my disposal prevents me from dealing on this matter in a more ample way, for it is interesting, in my opinion to give a broader idea of this subject; but I have the honor to place myself at the orders of anyone interested in obtaining further details on the subject, and I will be more than glad to privately furnish him with whatever information he may desire. (Applause.)

CHAIRMAN ARMITAGE: I believe we should have some copies of Senor de Silva's paper mimeographed for distribution to any of the members that would leave their names with Mr. Kriegh, or request it? I would like very much to have a copy of it.

I was going to call the attention of you gentlemen to the fact that the state of Louisiana, in February, 1921, had made and published a report of the assessment and taxation commission to their constitutional convention. It seems to be a very carefully prepared and thorough discussion of the subject of state taxation, with some very interesting appendices to it. They have a very interesting appendix, for example, of the investigation that they made of the mine taxation system. It seems that one of the members of this Louisiana Tax Commission took a tour around various states and in that tour he interviewed the heads of various tax commissions and tax officials and he had

the interviews taken down stenographically and that is an appendix to this report. Mr. Kriegh has succeeded in getting 4. I have one of those 4 and I think he can get some more for any of you gentlemen who would be interested in that. If a sufficient number want them I think the state of Louisiana would publish some extra copies. If any of you gentlemen want a copy of that report or a copy of this report of the special revenue commission of New Mexico, I think it would be better to get them through the Mining Congress. I think if the American Mining Congress took it up with them they would take the trouble of publishing additional reports and sending them on.

We have with us today various representatives appointed by the governors of the different states to explain the laws in relation to mine taxation of those states. I think I would like to call upon the Minnesota representative. Mr. Armson is a member of the Minnesota Tax Commission and is familiar with the laws, and I take pleasure in introducing him. He has come especially at the request of the Congress to explain these tax laws and the method of taxing mines.

HON. J. G. ARMSON: Mr. Chairman and Gentlemen of the Conference: If you will permit a word of personal apology this morning I would like to make it. It had been my wish to be present yesterday at your conference but owing to illness I was not able to come down and I was a little doubtful last night whether I should attempt the trip or not but I did, and I am glad to say that I feel fairly fit this morning.

In order that I might not take up too much of your time and say briefly just what I want to say, I have committed some of my thoughts to paper, and with your indulgence I will read rather than speak to you extemporaneously this morning.

Mr. Armson presented his prepared manuscript on "Mine Taxation in Minnesota," as follows:

Less than a generation ago Minnesota was regarded as mainly an agricultural state. Today, while we still have our fertile agricultural lands, we not only lead all of our sister commonwealths in the production if iron ore, but for some years past our state has produced more than 60 per cent. of all iron ore mined in the United States.

While it was known more than 50 years ago that Minnesota had considerable deposits of iron ore, it was well in the nineties before these deposits began to assume commercial importance. Since the initial shipment was made, and up to the beginning of the present year, more than 615,000,000 tons of iron ore have been shipped out of the state, and we still have a remaining measured tonnage of merchantable iron ore of more than 1,300,000,000 tons in the ground. In addition, we have hundreds of millions of tons of low grade and magnetic ores that are not now merchantable but in time will be made commercially valuable by improved methods of benefaction.

The state began to give special attention to the taxation of iron ore about the time the first shipments were made from the Vermilion range. Our earliest law imposed a tax of 1 cent. per ton on all ore mined in the state. This tax was in lieu of all other taxes and assessments on mining property, the law apparently being designed to encourage the development of mining industry in the state.

The output or tonnage tax remained in force until 1897, when it was repealed by Chapter 40, Laws of 1897, following an opinion rendered the previous year by the attorney general that the law was unconstitutional. Since that time iron ore in this state, both mined and unmined, has been assessed and taxed on the ad valorem basis.

Prior to 1914 the laws of the state required all property to be assessed and taxed at its true and full value. This law, however, had never been observed or enforced by assessing officials. Instead, the practice of assessing property at a percentage of full value had become so universal throughout the state as to have almost the force of law, and, in a measure, to receive legislative sanction, for practically all of our revenue laws were based on the assessment of property at less than its full value.

By Chapter 483, Laws of 1913, effective January 1, 1914, property was divided into four classes for purposes of taxation, each class being subject to assessment and taxation at a different percentage of true and full value. Iron ore, whether mined or unmined, constitutes Class 1 and is subject to taxation at 50 per cent. of its true and full value. This is the highest percentage applied to any of the four classes, Class 2 being subject to taxation at 25 per cent., Class 3 at 33⅓ per cent., and Class 4 at 40 per cent. of true and full value.

In the earlier years of the application of the ad valorem tax method to iron ores no serious attempt was made to adopt any scientific rule of valuation. No reports of tonnages and mining or other cost data were required from mining companies, and hence no reliable information was available upon which such properties could be even approximately valued for purposes of taxation. As a consequence, the assessment of iron ore in those early days was largely a matter of guess, or of compromise between assessing officials and mine owners and operators.

Among other subjects that first engaged the attention of the tax commission when it was organized in 1907 was that of some method of measuring the taxable value of real property other than mere guess, or arbitrary opinion, or the revenue needs of a community, methods that had so long prevailed throughout the state in the assessment of all kinds of property. After careful investigation and study of the subject, it was decided that the selling price of property not only fairly represented its taxable value, but at the same time was in harmony with the law which provides that the price for which property sells at private sale

shall be taken as the "true and full" value of such property for purposes of taxation, hence the adoption by the tax commission of the "sales method" of determining the taxable value of all real property.

But it was found that sales of fee title to ore properties were not sufficiently numerous to justify their use as a measure of the taxable value of such properties. The leasing, rather than the absolute sale of ore properties, was the method most generally followed in the ore belt. As a consequence, the tax commission was obliged to adopt a rule other than that of the sales method for the valuation of ore properties. It was finally decided that the selling price of ores at Lake Erie docks, less the cost of mining and shipping the same, fairly determined the present values of such ores in the ground. As it would be manifestly impossible to mine and ship all of the ore deposits in a single year or in a dozen years, it became necessary, in order to ascertain the present value of the future worth of such ores, to apply a percentage discount to present values extending over the expected life of the mines, the latter being basd on measured tonnages and average expected annual shipments.

This, in brief, is the method followed by the tax commission in valuing iron ore in the ground for purposes of taxation. It may be aptly described as the net profit method of ascertaining the taxable value of iron ore deposits. The tax, of course, is applied to the value thus ascertained, and not directly to the profits. But in effect it is similar to a net profits tax, because under this method, in the final analysis, profits determine the values upon which the ad valorem tax is levied.

In valuing iron ore the following factors are taken into consideration:

(1) The measured tonnage of ore as of a given period; (2) the grade of the ore; (3) the character of mining; (4) market value of the ore; (5) cost of mining; (6) profit from operation; (7) expected life of the property; (8) present value of future profit based on the expected life of the property.

To give a concrete example of the application of these factors, let us assume that a given property, fully developed and in operation as an underground mine, contains a deposit of 3,000,000 tons of iron ore, grading 51.50 per cent in natural iron content, and of a non-Bessemer standard. It is found that the average market price of this grade of ore at Lake Erie ports for a 5-year period was $4.50 per ton. The average cost of mining during the same 5-year period was $3.00 per ton leaving a net profit of $1.50 per ton on the ore mined and shipped. Assume average annual shipments of 100,000 tons. Based on this average of annual shipments the life of the mine would be 30 years. The present value of $1.50 per ton extended over a period of 30 years, discounted, say at 8 per cent., would be approximately 56¼ cents. Applying this rate to the tonnage in the mine, we

find the present value of the 3,000,000 tons of ore would be $1,687,500.

For purposes of taxation mines are classified according to grade of ore and character of mining as follows: Class 1, open pit, low mining cost, high grade ore; Class 2, open pit, moderate mining cost, medium grade ore; Class 3, open pit, high mining cost, mixed grade ore; Class 4, underground, low mining cost, high grade ore; Class 5, underground, moderate mining cost, medium grade ore; Class 6, underground, high mining cost, mixed grade ore; these classes are further divided into "active mine tonnages" and "reserve tonnages," the former including developed tonnages, whether active or inactive, and the latter undeveloped tonnages held for future operation.

Based on the valuation factors enumerated in a preceding paragraph, the value per ton of the ore in the different classes of mines in 1920 was as follows: Class 1, active 80.22 cents, reserves 51.04 cents; Class 2, active 72.88 cents, reserves 43.68 cents; Class 3, active 65.72 cents, reserves 36.54 cents; Class 4, active 55.86 cents, reserves 26.66 cents; Class 5, active 46.20 cents, reserves 24.36 cents; Class 6, active 34.02 cents, reserves 19.54 cents.

Perhaps it should be stated that while the rates above enumerated are generally applied to all mines falling within the respective classes, occasional modification of the rate is made where abnormal mining conditions or other unusual circumstances render the standard rate unfair.

The total measured tonnage of merchantable iron ore in the state on May 1, 1920, the latest available year, amounted to 1,341,674,538 tons. These tonnages were valued for purposes of taxation at $591,556,698, or an average value per ton of approximately 44 cents. Under the laws of the state iron ore, whether mined or unmined, is taxable at 50 per cent of full value. The taxable value of iron ore in 1920 was therefore $295,778,349, the average taxable value per ton being 22 cents.

In Minnesota public revenues are derived mainly from the general property tax, supplemented in part by a gross earnings tax on railroads and certain other public service corporations. All property not specifically taxed is subject to state and local levies. The state levy is at a uniform rate on all property, but local levies vary in different taxing districts according to local needs. Iron ore is therefore subject to the same tax levies—state and local—as all other property subject to the general property tax, except money and credits.

The total of taxes levied for all state and local purposes on mineral property in 1920 amounted to $20,255,223. Of this amount the state levied $1,603,119, and the counties and local districts $18,652,104. If all taxes imposed on mineral property, whether active mines or reserve ores, should be charged against the ore mined, the levy last year, based on an output of 39,500,-

000 tons, would represent an average charge per ton of approximately 51¼ cents. Of this amount, 4 cents represents state levies and 47¼ cents county and local levies. Based on the total measured tonnage of merchantable ores, the tax last year was approximately 1½ cents per ton.

That twenty and a quarter million dollars levied in taxes on the mineral property in a single year is a considerable burden on the mining industry of the state will not be denied. Less than 8 per cent. of this amount, however, represents a state burden. Local levies are largely responsible for the heavy taxes paid by mining companies.

Let me cite just a few instances of heavy local levies. The average per capita levy for local and school purposes in 77 cities and villages in the state, not located in the mining districts, amounted to $31.89 in 1920, while in 17 cities and villages located in the mining districts the average per capita levy for local and school purposes last year was $164.29. The levy in one village of about 2,000 inhabitants represented a per capita tax of $557.28 for every man, woman and child in the village. Another village levied $320.16, one $263.15, and another $244.91, while the so-called "richest village in the world" had a per capita tax levy for local and school purposes of $222.13 for each of its 15,000 inhabitants.

An effort was made at the last session of the state legislature to curb extravagant local tax levies by placing a per capita limitation on the amount that might be levied for local and school purposes. Under existing general laws the limitation is based on assessed value, but this limitation is practically worthless in districts having large taxable values due to iron ore deposits. A bill limiting the per pita levy for local and school purposes to an amount ling $90.00 per inhabitant was introduced in rly this year, but before its final passage wn to $160.00. While even this large per curb local tax levies in some mining dis nit a per capita tax levy in mining di es greater than the average tax levy fc ining districts.

There is one ot taxation to which I desire to make bri

For more than led "tonnage tax" question has eng ate legislature at each of its sessio branches of the legislature impos o 5 cents, based on metallic cont e year, but the bill was vetoed

At the extra 1919 another bill passed bot 5 per cent. of the value of th he year, less

certain mining and shipping costs. This bill was also vetoed by the governor.

A new tonnage tax bill in the guise of an occupation tax made its appearance in the legislative session of 1921 and was enacted into law. Under this law a tax is imposed on persons or corporations engaged in mining iron ore equal to 6 per cent. of the valuation of all ores mined during the year. The valuation upon which the tax is imposed is the value of the ore at the mouth of mine, less the cost of mining and shipping the same, such value and costs to be determined by the tax commission. Royalties paid are included in deductible costs.

Mining companies are required to make detailed reports to the tax commission showing amount and grade of ore produced, mining and shipping costs, the market or selling value of the ore and such other information as the commission may require.

The tax imposed under the law is due on May 1st of each year, and if not paid before June 1st, a penalty of 10 per cent. attaches. The tax is in addition to all ad valorem taxes—state and local—and is to be paid into the state treasury and credited to the general revenue fund of the state.

The new law is not a child of the tax commission. While the commission at the request of the committee having the bill in charge, aided in its preparation, it does not then, nor does it now, approve of the underlying principle of the law. The occupation tax theory of the law does not appeal to at least a majority of the commission, while the rate of tax imposed under the law is regarded as excessice. In its last biennial report the commission discussed the tonnage tax question at some length. But it did not recommend [illegible]nage tax. It did, however, recommend that if a so-call[illegible]law was enacted, the taxes imposed under it sh[illegible] other state taxes on mineral property, ar[illegible]r county and local purposes should be [illegible]. to 33⅓ per cent. of full value, in ord[illegible]x burden imposed on mineral propert[illegible]han that imposed on farm property.

Neither of these [illegible]ed by the legislature. The tax i[illegible]ditional burden on mining compa[illegible]l valorem taxation remains at 5

As the consti[illegible]all probability, be contested ir[illegible]ism of its provisions on the [illegible]h its administration would [illegible] at this time.

MR. ART[illegible]hese taxes I understand [illegible]at, of course the mining [illegible]ne taxes and when you [illegible]ate, local and

federal taxes, you can see at once you get a tremendous figure as a tax on the iron and ore.

MR. CHAS. R. HOWE (Arizona): In addition to your twenty million dollars tax that you say is placed on the mining by the ad valorem system, do you also impose a 6 per cent. tax?

MR. ARMSON: We do, Mr. Howe, under the new law. If the state sustains the law it is an additional burden.

MR. HOWE: Approximately how much more would that add to the twenty million?

MR. ARMSON: During a discussion of the legislature it figured at approximately four and a half million dollars. That, however, would vary. They are going into court and attack the constitutionality of the tax. This year if the mining companies pay the tax it won't be very large because the mining operations have been very much reduced, but on an assumed average annual production of forty million tons, it was estimated the tax would run between four and four and a half million dollars.

MR. HOWE: That would aggregate something like twenty-five million dollars annually for state, county and local purposes. Is that correct?

MR. ARMSON: That is correct in a measure. The figures that I have given you on local taxation were those of 1920, the levy made last June and payable this year. They haven't always been as high as that. They may not always be as high in the future although I think this year there won't be any substantial reduction. The total taxes 2 years ago or 3 years ago at any rate wouldn't be more than half the figures I gave you just now.

I want to say with due respect to my mining friends, a number of whom I see here, that notwithstanding those high taxes of a year ago, the federal government imposed a tax 2 years ago of still larger amount on income and excess profits and I didn't hear so much complaint about the federal tax. There is something peculiar about that, you know. When we pay a federal tax we do a little bit of grumbling but when it comes to state tax we stand up on our feet and holler.

The mining companies on their output of 1918 paid a federal tax of $21,272,000. They paid more in federal taxes in 1919 on their operations of 1918, than the local taxes amounted to this year. That was the highest amount they have ever paid. The total federal taxes last year amounted to a little over six and a quarter million dollars. In 1918 they were nearly fifteen million dollars. Prior to that they were nominal only.

MR. E. E. HUNNER (Minnesota): I would like to have you explain to them the personal tax on the stock pile.

MR. ARMSON: The open pit mines as a rule were operated in the summer season and seasons suitable for outdoor work. Many of the underground mines are operated all the year

'round. In the late fall and during the winter the ore taken from the underground mine is put in a stock pile, as we call it, as we cannot move it down the lakes in the winter-time and it is stock piled.

Ore in the ground in the original deposit is construed as real property with us while if it is severed from the ground and elevated and placed in the stock pile it is regarded as personal property and is taxable as such. Ore in the stock pile takes a much higher valuation than ore in the ground. The ore in the ground, as I explained, has applied to it an exhaustion period, it is the life of the mine. We figure that perhaps it takes 30 years to exhaust the deposits of a given range and we ascertain the present value of the future worth of that ore extended over those 30 years, but your ore in the stock pile is going to be shipped out just as soon as navigation opens and that takes the rate of your present value, not discounted but immediate present value and that rate in some cases will run up very high. In a few cases it went practically as high as $2 a ton assessed value, $1.75, $1.50 and $1 and down lower, and is a very substantial burden on winter operations under ground mining with us. The mining with the ore in the ground is taxed we say on the basis of perhaps 28 cents a ton and I will say more when ore is piled up on top of the ground and it remains there and is there on May first of the year, it is liable to take a valuation of $1.50, $1.75 or $2 a ton, thus making the tax perhaps 4, 6 or 8 times as high on the ore in the mine.

It has been represented to the commission that that proposition of law is rather discouraging winter operations of mines and perhaps it does. You have probably heard Mr. Hunner say that we have made some concession this year and reduced stock piles all over the field ranges probably 25 per cent. That is, we took the market value less cost of shipping and all the cost that we deducted and then from that we deducted still further 25 per cent. of the value so we made some little concession this year toward that. It might encourage the operation of some of those properties in winter and we need it this year perhaps as it has been a long time since we have had such unemployment, a good many years since the outlook was so gloomy as it is now for the next few months. I am not a pessimist, I don't believe that this country with its immense resources, with its energy and vim and vision of its citizenship is going to remain dormant very long. We are going to get back to normal conditions shortly but it is going to take a little time to do it and in getting back to normal conditions it seems to me that it is up to every citizen, every corporation, to do all they can to bring about those conditions but it is not alone up to the individual and the corporation, it is up to the governments both federal and state, to reduce those excessive tax burdens that property now is struggling under and we can

only do that by reducing expenditures. Our little contribution of 25 per cent. was done in the hope that it might encourage many of the mines to operate this coming winter and thus give employment to people that otherwise would be idle.

MR. J. C. DICK: Do I understand that the valuation is two hundred some millions of dollars and there were levied upon that sum twenty million, or a little over 10 per cent. of the valuation? Do I understand if a man owns a house worth $1,000 he would have $100 tax to pay?

MR. ARMSON: It wasn't quite 10 per cent. The valuation was about two hundred ninety-five billion dollars, and a tax of twenty million dollars, it would be a little less than 7 per cent. yet not on full value. Of course that means only 50 per cent. of the value of the mine so that your actual tax at that place would be only a little over 3 per cent. of actual value because the tax is levied on 50 per cent. of full value. The average tax rate in our state last year for all purposes, including mining properties, was about fifty-six and a quarter mills. That tax was levied on taxable value of approximately 35 per cent. of full value, a little lower than one-third of full value. Our taxes are very high in Minnesota. How are they in Arizona, Mr. Howe?

MR. HOWE: I thought, Mr. Armson, that they were very high but since I have heard from Minnesota, I have concluded that they are not so high.

MR. ARMSON: We don't claim low taxes in Minnesota but don't misunderstand me, Mr. Howe. The entire state doesn't levy taxes like those mining districts that I have enumerated.

MR. BARRETT (Michigan): I would like to ask one more question about that stock pile. We have the same problem up there only more so on account of the fact that all of our mines are under ground operations with the exception of two. Now in handling this stock pile in Michigan we determine the actual value of ore in the ground and ore in stock on January first at the same rate, we treat it as if it were in the ground. Then, in the case of the stock pile assessment, we subtract the value of the stock pile as personal property and the balance then remains upon the real estate, in other words, there is no discrimination between the ore in the stock pile as to rate. Is that true in Minnesota?

MR. ARMSON: No. That was the practice 10 years ago in Minnesota. The ore in the stock pile took the same rate as the ore in the mine from which the stock pile had been mined. It was technically wrong under the law. The ore in the stock pile was regarded personal property; in the ground it is real.

We do the same in the matter of deductions, Mr. Barrett, for instance a mine that had a hundred million tons, if it had shipped a hundred thousand tons this year, we deduct that from the million and tax it next year on the basis of $900. We also

deduct the stock pile from the ore remaining in the ground so that we don't tax it twice that way, except if the stock pile remains there for the second year it is taxed twice but we deduct the amount shipped and stock pile from the ore in the ground and then tax the ore in the ground at the reduced tonnage and tax the stock pile as personal property at an increased value.

MR. D. M. KELLY: Might I ask a question. Has your commission any statistics showing whether a ton of ore which would be mined say 20 or 25 years hence and subjected to a continuous tax rate of 3 per cent. would have any value—any present value?

MR. ARMSON: That would depend on the grade of ore you were considering. I think I know of some ores in Minnesota that they wouldn't give you very much for on that basis. I know of some other ores I would like to buy on that basis and pay considerably more for them.

CHAIRMAN ARMITAGE: Your illustration was a mine of 30 years. The question raised itself in my mind as to whether that ore, if it were subject to a continuous tax rate of 3 per cent., would have any value after 30 years.

MR. ARMSON: Sixty per cent. anyway.

MR. D. M. KELLY: Your mines in Minnesota were assessed last year at two hundred ninety million, and paid a tax of twenty million. Now if they continue to do that for 30 years or more what are they worth now?

MR. ARMSON: Oh, five hundred ninety odd million dollars full value at the present measured tonnage of merchantable ores.

MR. D. M. KELLY: If you pay the tax of twenty million dollars a year for 20 years that would be four hundred million dollars taxes.

MR. ARMSON: Probably if you figure the tax on your home for 20 or 30 years and compound the interest on it, the tax amounts to more than your home is worth at the end of several years. We must figure every system. All property is supposed to contribute a fair share toward the government.

MR. THACHER: To what is it subjected?

MR. ARMSON: Let me call your attention to another phase of that If our ore should be exhausted in 30 years, and I don't believe it will, the present merchantable tonnage at the present rate of mining would perhaps last 35 or 40 years. We have immense tonnage of low grade and magnetic ores and probably will develop new tonnage of merchantable ores but at the end of 35 years, we will say at the average rate of shipping in the last 5 years, the state of Minnesota won't have any ore. We have lost our wealth. It isn't in the state, 95 to 98 per cent. goes out of the state. Now are we going to lose that wealth? Are we going to have it carried out of our state, taken away forever without exacting a good, reasonable contribution from

that property? Many of those properties were acquired for $1 an acre many years ago. The surface of many of our richest mines was originally covered by timber and was bought by lumber companies without any supposition that there was ore there at all and some of those lumber men are living in Chicago, in Detroit, and New York. Those men acquired those lands years ago for a mere song, they haven't paid anything for them, nothing to speak of. Of course, some of the recent ones were paid much more for, but the bulk of the mineral property of the state of Minnesota is owned by non-residents of the state and the ore is being shipped out of the state.

JUDGE STIMSON: Where are you going to get your money for taxes after you have exhausted those mines?

Mr. ARMSON: I don't know. I think those mining districts are proceeding with the theory of getting it while the getting is good.

SECRETARY KRIEGH: What percentage of the value of the ore produced goes into the labor employed in Minnesota, that is, to citizens of the state?

MR. ARMSON: A considerable percentage goes to the labor, a part of which, however, is not a part of the citizenship of the state. A great many foreigners are employed. Of course, we are trying to Americanize them up there and are succeeding to some extent but when you get into some of the mining districts you might feel that you are in some of the southern countries of Europe. We are building up cities and producing some wealth that way. Of course, it is largely a floating population. Compared with the total number employed, the number that own homes is very small.

MR. HOWE: Under your system of assessment, would not the amount of taxes become correspondingly less as your tonnage of ore grew less until the end of the 30 years that you speak of as your tonnage grew less?

MR. ARMSON: Yes. We have properly reached the very peak of valuation now unless market values become a factor in changing that, because we have probably reached the peak of our merchantable tonnage. While we hope that we are going to develop new tonnage from now on we expect a gradual decrease in taxable tonnage.

MR. HOWE: It wouldn't be twenty million a year for 30 years.

MR. ARMSON: No. That was an excessive levy and probably wouldn't be that again for years, but it would grow gradually less each year. We included in our last biennial report a chapter on tonnage taxes and net profit taxes, I think that was the title, in which we gave some figures showing with that present rate of shipping how long the ore will continue and what the taxes will amount to each year until the ore becomes

exhausted on the ad valorem basis. I will be glad to mail you copies if any one so desires. That will give the information you want.

CHAIRMAN ARMITAGE: Mr. Armson, I suggest that any gentleman here who wants copies of that report leave their names with Mr. Kriegh, and he will communicate with you.

MR. ARMSON: I'll be glad to furnish copies to all who request them. I probably have ten or a dozen in my room.

CHAIRMAN ARMITAGE: Mr. Dick, are you familiar with the local tax law of Utah in reference to mines? If so, I would ask you to explain that to us briefly. Mr. Dick for many years was head of our Natural Resources Department of the federal government and made a specialty of the study of federal tax laws as applied to mines. I am calling upon him in the absence of Mr. Mackenzie.

MR. J. C. DICK: In the question of valuing mines, the preceding speaker has given a very good idea to my mind as to how mines should be valued, if you want to get at the value of them. But the value of mines for state purposes or the value of mines for federal purposes or the value of mines for another purpose are three different things. In valuing mines for federal purposes the valuation is not the same. That may seem strange but it is a fact.

The law says you shall not include any ores but those that are definitely known, nothing beyond that which at present is developed in other words, while in their computation for depletion the law there says you shall not take into consideration only the ores in sight but the probable ores and the prospective ores.

Again, in the federal law the value of your mine might be what you paid for it, plus the cost of development and prospect. This development and prospect worth to the extent of a hundred thousand dollars may determine that the mine you originally paid one hundred thousand dollars for is not worth 30 cents. Its sales value may be 30 cents, and the computation made by the federal government is to the value of one hundred thousand dollars. There is absolutely no similarity at all.

I believe that the valuation of mines for state tax purposes is altogether a state issue. The method of valuing mines in Michigan or in Minnesota might not at all do in Arizona, Utah, Wyoming or the West. I believe that the valuation of the mine when one goes into valuation of mines for tax purposes is more of a tax job than it is a valuation job. The laws of the federal government should not be to my mind such that they make or tend to discriminate between taxpayers. The tax should be equitably distributed so far as possible. In Utah it would be absolutely impossible to get at the value of mines by the method used in Michigan and approach at all an equitable basis for taxation. If the mines of Utah were taxed or valued as the

United States Government values mines for invested capital purposes, including only those ores developed, there would be very few mines paying taxes.

We have a system in Utah that taxes the mines upon the basis of valuation of three times the annual proceeds. This three times the proceeds was brought about by the reason that physical property in general, personal property in general, had been taxed at about one-third its total value and mines had been taxed on their net proceeds. The legislature concluded to raise the value not one-third but assess on the total value of physical, personal property. Therefore, to make it equitable and not change the ratio they concluded the mines should be assessed on three times. A great many mines are not worth three times the proceeds. Just the other day before leaving Salt Lake City I was on a tax case. A man was assessed three times his 1919 tax. The law I believe came into effect in 1919. This was a dump assessed on three times its net proceeds for 1918. The dump was worked out, $20,000 I believe was taken out of the dump in 1919, cleaning it up, yet the tax for 1919 was on three times the product or net proceeds of 1918.

To my mind the net proceeds of a mine is a fair way to tax or to value mines upon which to assess the tax. You do not know in Utah how many years these mines are going to run. Some of them have been going for 40 years and I believe some of the prospects now in the making of mines will be going for 40 years. When an engineer goes out to buy a mine for cash he has got to know pretty much what is there. He doesn't go very strong on indications. When it comes to paying full value for the mine he wants to know pretty much the full value is there.

It is a little hard on the state of Utah a year like this when there are no net proceeds. The mines are closed down pretty much. I believe that three times the net proceeds is right and the state of Utah is giving a great deal of consideration to this question and I am not sufficiently versed in the conditions to criticize the action that the legislature has taken. Maybe three times is pretty near the value of the mines in Utah and pretty near the share of the tax that the mine industry should pay. The mining industry of Utah wants to pay its full share, of course. I believe if you are to get at the full share that the mining industry should pay, you should consider the millions of money perhaps that have been spent in prospecting and finding these mines. In other words, give back to the industry tax free the amount of money they have spent in finding and producing these mines upon which you are assessing a full valuation.

I am assuming that three times is an equitable basis of valuation, and if I were making a suggestion as to a change, I would not assess it on three times the net proceeds of the year but on the average or three times the average of the three preceding years. That would give the state an income in its lean years

and, too, I wouldn't assess a mine three times its net proceeds or three times the average of the three preceding years if the taxpayer showed me that he had but another year to live. I think that change should be made in the law.

I haven't got much sympathy for this cry of heavy taxation for conservation, holding our ore for posterity. In fact, heavy taxation tends to the contrary. If your taxes are heavy, such as those taxes of Minnesota must be, there is a great deal of ore being left in the mines today that would be mined and brought to surface. That is not conservation, it is waste and that is what the heavy taxation laws of Michigan and Minnesota are tending to do.

I am sorry I can't go into the laws of Utah in full, but I am not sufficiently acquainted with how they have been operating the last couple of years. (Applause.)

MR ARMSON: Mr. Chairman, I would like to express just one thought. In my opinion it would be impossible to devise a taxing system for mines that would suit the conditions of all of the states of the union. The nature of the ore deposits of Minnesota are entirely different from the nature of the mineral deposits of your western states. The great bulk of our ores can be accurately measured, the tonnage can be accurately determined by drilling. We are not guessing at it as you have to in Utah and some of the other states.

Just the other day we had occasion to place the Alpenna practically on the exempt list. A few years ago it had a tonnage of about 7,000,000 tons. It is exhausted. The measurement of the tonnage that we had charged against that mine checked out within about seventeen and a half thousand tons.

Now I don't want the gentlemen to go away with the idea that we have excessive taxation. Our taxes are high, but on the basis of 50 per cent. of value that the property is taxed on, mines are not taxed relatively any higher than farm lands on the percentage of 33⅓.

Now just so you won't run away with the idea that we have been collecting a tax of twenty million dollars all these years, I want to tell you the year before all the tax was seventeen million dollars. The year previous to that twelve million dollars. In 1916 they were seven million nine hundred thousand. In 1917, nine million nine hundred seventy-two thousand. We haven't been getting that twenty million two or three years.

I believe that Michigan and Minnesota and perhaps Alabama and a few of those states can use about the same method of valuation in their ore but our method wouldn't suit the conditions in Utah or Arizona and Montana, and your methods wouldn't suit us. We can measure tonnage and we can determine value in advance; you can do that in Minnesota.

CHAIRMAN ARMITAGE: May I ask, Mr. Armson, if you have any figures showing the per capita cost for the year 1920?

MR. ARMSON: No, I think not later than 1918.

CHAIRMAN ARMITAGE: What did the last one show?

MR. ARMSON: I haven't it in mind and I wouldn't care to guess just now. It was high enough I will say.

CHAIRMAN ARMITAGE: Gentlemen, I want to impress upon you the importance of Mr. Dick's statement that in his opinion the net proceeds method is the best method for taxing mines for state purposes.

Mr. Dick was the head of the Valuation Section of the Natural Resources Division of the United States Government. He was the first man who really, seriously, intelligently tackled the problem of valuing all the mines of the United States on the ad valorem basis for the purpose of determining depletion and also invested capital. He didn't merely value some mines in some localities and some states but he had to value all the mines. He struggled with that problem with the best aid that he could get for many years and he now comes and tells you, after that experience, that in his opinion that is not the proper way or the best method of taxing mines for state purposes. Now just think of what that means. Here is a man who is probably more qualified to tell you the value of the ad valorem system of taxing mines than any man in the United States, who has had more experience with it in the practical way of valuing mines, and he tells you after that experience that in his opinion it isn't the best method or the proper method or the fair method of valuing mines for state purposes. Now I want you to consider just what that means and the weight to be given to that.

MR. ARMSON: Mr. Dick, I believe you said that three times the net proceeds is the best method for state taxation.

MR. DICK: Yes.

MR. ARMSON: I have in mind one mine in Minnesota having twenty odd million tons of ore in its deposit that has not been operated since I have been on the commission and I have been serving now nearly thirteen years. For 14 years we will say this mine hasn't been in operation at all. How do you apply your rules to property of that kind?

MR. DICK: Why should you get any tax on non-operating mines? You tax it as surface land.

MR. ARMSON: The surface is removed.

MR. DICK: Then what are we discussing, a hole in the ground?

MR. ARMSON: That ore is ready to ship any time they are ready to put their shovels in, but for their own benefit they let it lie idle. Are we going to exempt that property until they begin to operate?

MR. DICK: Yes. What do you do with the farmer that has got a thousand acres of wild land, you don't tax it?

MR. ARMSON: Absolutely.

MR. DICK: Land is valued on what it produces. Five years ago we say that was wild land but today it produces grapes that are selling at $200 a ton. It is now producing and it is assessed at that high valuation. Why not treat the mines the same way and give the mining industry this consideration that I think is their due.

MR. ARMSON: I think this point is worth discussing here because you made a statement to this conference that we don't think applies to Minnesota and we don't believe that you are justified, or Mr. Dick is justified, in advocating a system that suits Utah and Arizona and tell us in Minnesota it will suit us better than the system that we have had for 15 or 18 years and have investigated just as carefully as Mr. Dick has his system.

I want to say that we do tax the farm lands. We have idle farm lands on the tax rolls. We tax all property. Do you think that it is fair to permit a corporation, for its own future profit, to let its property lie idle there indefinitely and charge them no taxes? Are we going to permit them to carry wealth of a great many million dollars and derive no revenues until they are ready to operate it 10, 20 or 30 years hence, while at the same time we are taxing your property, your home, your wild land, your approved land and all other property you have in the state? I submit that it is no right. We have one corporation (I don't say this in an unfriendly spirit) that owns probably 60 per cent. of the ore deposits of the state. They have acquired large holdings and they are not operating some of the mines. The one I have in mind is not being operated and hasn't been for 14 or 15 years. Why are they holding it? For their own profit in future use.

CHAIRMAN ARMITAGE: Now it seems to me logical, upon your theory of taxing mines, that an idle mine should be exempt. As I understood your theory of taxing mines heavily, it is because they are depleting the resources of the state and taking out of the state today the value, and, therefore, the proportion of that value before they take it out should be held by the state. Now it logically follows from that that if a mine is not doing that, it should not be so heavily taxed or should be exempt.

MR. ARMSON: It is not so heavily taxed, Mr. Chairman, because if it is reserve ore we apply a lower rate to it; we don't tax it as heavily as the ore that is being taken out and the mine that will be exhausted in the next few years, but why it should escape taxes is beyond my comprehension.

MR. DICK: I understood you to say it is held there by corporations until it becomes more valuable or when it becomes more valuable the state will get a greater proportion of tax from it.

MR. ARMSON: You misunderstood me on that. I said until it became needed. It may be that ores won't be any more

valuable 20 years hence than they are today or they were a year ago. They reached a pretty high point a year ago, but that corporation is holding it for future needs, that is all.

MR. DICK: May I add just a word that I think I forgot? In speaking of the state tax of Utah, I forgot to mention, I believe, that the mines also pay a tax on full value of all their physical equipment and mills and stuff of that sort, also a valuation upon their surface land.

CHAIRMAN ARMITAGE: From Arizona has come Mr. Charles R. Howe, the Chairman of the Tax Commission, at our invitation extended to the governor. He has been appointed a delegate to explain the tax system for taxing mines in the state of Arizona. I don't know of any more qualified man than Mr. Howe to explain that system. As soon as Mr. Howe has explained that, we will close the session and throw it open for discussion this afternoon.

MR. CHARLES R. HOWE: Mr. Chairman and members of the Mining Congress: I have listened with a great deal of interest to Mr. Armson's discussion of the Minnesota system and the resultant discussion from the members that has come from it. I had thought that our problems in Arizona were almost insurmountable and that our tax rate and amount of taxes that it took to run our government was huge, but after hearing from some of the other states, I am not so discouraged in that respect.

Several days ago Governor Campbell called the members of the Tax Commission to his office and stated that he had been requested by the American Congress to send a delegate from Arizona up here. I asked him at that time what the purpose was for sending a delegate at this time and he said he was unaware with the exception that possibly it might be for the purpose of ascertaining our methods of taxation and constructive criticism thereof. Constructive criticism is always beneficial to any taxing body and the taxing officials of Arizona welcome constructive criticism.

The Arizona method of taxation is predicated on three things: First, the needs of government; second, the ability to pay; and, third, the wasting asset with reference to the future of the state.

Now in explaining the method, first blank forms are transmitted to all individuals, companies or corporations owning producing mines. These blank forms I may say call for minute detailed information relative to practically everything that enters into the accounting for the mining company or corporation that is operating the property.

The Commission has defined a producing mine to be one whose net earnings, after all deductions for extraction, milling, smelting, converting, transportation, as well as all taxes and overhead, including both local and eastern office, and administration taxes,

are in excess of $5,000. In other words, after all of these deductions have been made, if they show a net earning in excess of $5,000 the mine is termed to be a producing mine, that is for the year prior to the first of January in which the assessment and appraisement is made. These allowances are far greater I note than those of any other state so far as I have been able to ascertain.

The second operation in our method is classification. Classifications are then created, which to date include the following:

First, copper mines whose ore bodies are found in advance and do not show evidences of exhaustion.

Second, copper mines whose ore bodies consist of porphyry deposits and large acres of grounds largely unexplored and undeveloped and do not show evidences of exhaustion.

Third, copper mines whose ore bodies consist of developed, low grade porphyry deposits and do not show evidences of exhaustion.

Fourth, copper mines whose ore bodies show evidences of exhaustion.

Fifth, gold and silver mines whose ore deposits show evidences of exhaustion.

Sixth, lead, tungsten and molybdenum and asbestos mines.

Seventh, all producing mines of irregular output.

Eighth, copper mines heretofore known producing ore of irregular production but whose present development indicates they will become regular producers.

Then there are several subdivisions.

Subdivision (a) which shall include all such properties as have entered the profitable productive state during the period of years under consideration.

Subdivision (b) which shall include all properties that have suspended profitable production during the period under consideration for reasons other than market or physical conditions.

Subdivision (c) which shall include all such properties that have suspended profitable production when such properties could have been operated at a profit during the period under consideration.

Then the third operation in the method is deciding the factor of capitalization for these different classifications in order to ascertain the ad valorem value of the property, for Arizona is operating solely under the ad valorem system of taxation. Our laws provide for nothing else than the ad valorem system and it is up to the tax commission to ascertain what the value of the property is by some method.

The property earnings have been capitalized over a period of years at the following percentages: Class No. 1, the factor of capitalization is 15 per cent; Class No. 2, 15 per cent; Class

No. 3, 15 per cent; Class No. 4, 20 per cent; Class No. 5, 25 per cent; Class No. 6, 20 per cent; Class No. 7, 20 per cent; Class No. 8, 30 per cent; Class No. 9, 20 per cent.

The next operation in valuing the mines is the different mines are assigned to their proper class. This is done after a careful consideration of everything that enters into the assigning of these mines to that class and all information possible to obtain is obtained by the commission in order that an injustice may not be done in assigning a mine to a class, because if a mine was assigned to an improper class, it would be valued possibly at a greater amount or a lesser amount than it should be.

Fifth, after obtaining the net earnings for a period of 5 years in the manner outlined, the total for this period is divided by 5 in order to find the average annual net earning. This net earning is then capitalized by using the factor set opposite the particular class in which the mine falls. The figure thus obtained is used as the taxable value for the current year of all mining claims or groups of same whether producing or not, if contiguous to producer. Also all other property of whatsoever nature actually used in producing the net earnings as heretofore defined.

In other words, the capitalized value after having been found by this method includes all the property—mining claims and smelters, mills and appurtenances of whatever nature used in the producing of the net of the several companies.

In assigning mines to their respective class great care is taken and due consideration given to non-ore bodies, present ore reserves, whether increased or decreased since last appraisement, geological formation with reference to probable future life as well as every bit of information possible to obtain as to the physical condition of the property from actual inspection. Also for sake of comparison a tabulation is kept of actual bids for the stock wherever quoted at least twice each month. While the commission has no knowledge of any stock actually being sold for the amount bid, it indicates at least the willing buyer if not the willing seller, both of which are necessary under the Arizona tax law in order to arrive at the full cash value that the law contemplates.

In passing judgment upon this method of taxation a number of things should first be taken into consideration. First, the law contemplates only the old general property tax or an ad valorem system of valuation. Now I have been attending our national tax meetings for many years and at each of these meetings (Mr. Armson will bear me out) we cuss and discuss the old general property tax but none of us have ever gotten very far away from it. A few states, three I believe—Massachusetts, Wisconsin and New York—have enacted so-called income tax laws to take the place of some of their general property tax laws, but it is not general and never have any of the states

been enabled to get entirely away from, or to any appreciable extent get away from, the old general property law.

Second, the full cash value of all property must be the assessed value in Arizona.

Third, the courts have held that the full cash value of a given property is what it will sell for as between a willing buyer and a willing seller, in the usual manner that such sales are made and not at a forced sale.

Now this applies, of course, to mines and to all property and I believe the mining men that are here will bear me out in the statement that I make at this time that the tax commission has always endeavored and is getting pretty close to the top values of all classes of property as well as mining property.

The fourth thing that should be taken into consideration in this respect is that seventy-three per cent of the area of the state of Arizona is exempt from taxation through being owned by the national government, either as forest reserve or as Indian reservation.

Fifth, the state constitution is wide open on the subject of taxation, the latest amendment reading as follows: "The manner, method and mode of assessing, equalizing and levying taxes in the state of Arizona shall be such as may be prescribed by law." In answer to this amendment the legislature created a state tax commission and delegated to it extraordinary power among which was the appraisement and assessment of producing mines.

Sixth, that every producing mine in the state, with one or two possible exceptions, have long ago returned to their owners the total capital investment. The records to August 13th show that a grand total of the dividends paid by the Arizona mines to that time were $360,781,069 and the total earned surplus as carried by the mines as of January 1st last was $271,984,365. The most notable case in this respect as having returned the capital investment is one of our large porphyry properties, with a total capital investment for property development and equipment of slightly more than fifteen million dollars which in the year 1916 alone earned, after all deductions as shown by their annual report to stockholders, slightly more than twenty-one million, even in the one year which was six million more than their total capital investment for every purpose of whatsoever nature. Thus it will be noted that the return of invested capital is not so pertinent to more than one or two properties in the state at this time.

Now with further respect to this method that we have in operation in Arizona, it has now been in effect for some 7 years, but has never been tested directly in our local courts. However, comparatively recently a case occurred in the state of Louisiana in which the state attempted to assess a large cor-

poration down there for a considerable sum of money and the taxing authorities of the state of Louisiana had used the Arizona method. The courts sustained that assessment.

The present method of taxing mines in Arizona was put into effect by the State Tax Commission at the beginning ot the assessing season of 1915 and has, therefore, been in use for 7 years. Little complaint was heard of its application during the first 6 years of its operation, though the peak of total valuation was reached in 1919, since which time the total valuation has been reduced some seventy-two million dollars. This was partially caused by the fact that the mines were making enormous earnings during the years in question and partially for the reason that the mine owners had labored untiringly with the legislature of 1915 to have enacted a law to value all mines at 4½ times the net, plus 12½ per cent of the gross output of each year. That was the law advocated in Arizona by the mine owners during the entire legislative session of 1915 and a special session called later on. However, it was not enacted into law. It later developed that this law, had it been enacted, would have valued all of the mines for at least the peak years during the war at considerably more than the method used by the tax commission for those years, though when taken over a 5 year period the later method exceeds the method advocated by the mine owners to some extent. Hence, little or no complaint was made until the present year. This leads one to believe that it is not so much the method used that is involved in the complaint at this time as it is the tremendous increase in all governmental expenditures as shown by the budgets of the state and all of its subdivisions which have increased from $6,823,000 in 1915 to slightly more than seventeen million in 1921. Of this total the producing mines being situated in counties having low tax rates and having practically no city tax to pay contribute a little less than eight million dollars and all other property something over nine million dollars of the total seventeen million dollars in taxes raised in Arizona.

The principal advantages claimed by the Arizona method is first, elasticity. This law that the mine owners proposed would have made it a hard and fast rule to have all mines, regardless of whether they were gold, silver, copper, or what not, valued at 4½ times the net, plus 12½ per cent of the gross, which in several instances that I can recall would have caused them to suspend operations entirely had it been put in force.

Second, avoidance of peaks and hollows or fat years and lean years. This is especially necessary in a growing state like Arizona whose principal industry is mining. The Arizona method levels off the peaks and uses them to fill in the hollows.

Third, its equalization of burdens within the class.

Now in conclusion, I believe that Arizona mining men present at this conference will agree that an honest effort is

always made by the tax commission to arrive at facts and if an error in administration is shown to exist, it is cheerfully corrected.

No perfect tax law or method of appraisement and valuation has ever yet found its place on the pages of the statutes of any state. If the millennium ever comes and a tax law satisfactory to all is devised by any man, or set of men, I feel sure that the American Mining Congress would be the first to transmit a fitting resolution to the powers above demanding in no uncertain terms that the reward shall be a crown in heaven.

I thank you. (Applause).

CHAIRMAN ARMITAGE: Gentlemen, if it is your pleasure we will adjourn now until 2:30. (Adjourned at 12:30).

THIRD SESSION

WEDNESDAY AFTERNOON, OCTOBER 19, 1921

The Third Session of the National Tax Conference convened at 2:45 o'clock, Mr. Robert N. Miller presiding.

CHAIRMAN MILLER: Gentlemen, our Chairman, Mr. Armitage, will be along in about a half or three-quarters of an hour and he desires us to go ahead and proceed along the same lines we started this morning and yesterday. With that in mind, we want to call on Mr. L. P. Barrett, who is appointed as the official representative of the state of Michigan to speak on the tax problems of that state in relation, of course, to the general problem that we are working on of uniform state taxation.

MR. L. P. BARRETT: I don't know that it is necessary to enter into any description of the Michigan system, it is purely an ad valorem system. There is one thing I would like to say though in discussing any method of taxation, and that is you have to consider something of the tax laws of the state. The Michigan constitution provides that all property in the state should be assessed at its full value. All properties are supposed to be assessed at 100 per cent value and the courts have held principally as they have in Minnesota that the criterion in this case is the sale value between a willing purchaser and a willing seller. Unlike Minnesota, however, there is no classification of property for purposes of taxation. All property is classified alike and the method in use in Minnesota appraisal doesn't aim to treat the mines any differently than it does farm property or anything else. Under the provisions of the Michigan law the local assessor is the officer who assesses all classes of property with the exception of railroads, public service corporations. The tax commission having general supervision of all assessing may, if they so desire, take over the assessment of any class of property. In 1911 they elected to do so in the case of mining property and Mr. J. R. Finlay was employed for this purpose. He made a complete valuation or at least an examination of all classes of property devoted to exploration of natural resources. As a result of his report it was found it would be inexpedient for the tax commission to actually appraise other than the iron mining property.

Coal mining in Michigan is of very small importance. Up until the last two or three years it has never paid. It has been purely a bill of expense.

The copper mines have been assessed for a number of years by the local assessors, the local assessors in all cases practically being the mining officials themselves who are the supervisors of the various political units. They have established what they

call stock market method of appraisal, not a method which is put out by the tax commission at all, it is purely a method that is operated themselves, in conference devised, and briefly it is this: they take the average stock market quotation of the shares of each of the companies over the preceding year. Then they classify the copper mines into three classes: dividend paying producing mines, producing non-dividend paying mines and mines which do not produce. Then with the average market value of the shares they determine each year what percentage will be applied to each particular class of property. In the case of the dividend paying mines in 1920, 93 per cent of the stock market was taken; in the case of the non-dividend producing, 70 per cent, and in the case of the other properties, other mines which do not produce and which are purely prospects, they took, I believe, 40 per cent (either 40 per cent or 50 per cent, I am not certain) of the stock market quotations. Now the stock market quotation is made by taking the outstanding shares and multiplying it by the average market value. That then determines the assessed valuation for all property owned by that particular mining company. In the case of the Calumet and Hecla, for instance, where they own interests in subsidiary concerns, that proportion of value is then deducted from the total calculated market value and the remainder would be spread upon the properties owned by the mining company. That also applies to land held which may be other than mining properties and that is deducted and the balance remaining would be on the distributed mining property.

Mr. Finlay's appraisal in 1911 included the copper mines. In 1919 I was asked to make an appraisal by the tax commission of the copper mines and got practically the same results. Strange as it may seem, in 1911 the chief criticism of Mr. Finlay's method was that he was too low. Apparently the stock market played more importance in their eyes than the actual valuation of the mines. This year there was a peculiar condition which I don't think it is necessary to discuss here. I made a revaluation to check the market value as determined by the mining men themselves with the same result again.

The iron mines have been reappraised every year and the system in use is practically the same as that used in Minnesota in the general outline. We differ in some respects, however, one of the principal points of difference being in the figuring of the stock piles. In the underground mines the ore is all sent to lower lake ports and it cannot be so sent during the winter and it has to be stocked. This is a condition which arises purely because of the climate. If we were in a warm climate, we could ship ore all the year. Under the Michigan law personal property is assessed at its market value as the second Monday in April, whatever that may be.

To assess stock piles at their market value would result in a

discrimination against the iron mining business. Our method of handling it is this: we determine the value of the ore in the ground and the ore in the stock on the same basis, that is, the total tonnage estimated ore in the ground and in the stock are added together on January 1st and the ore in the stock is not treated any differently than the ore in the ground. On the second Monday of April there is always considerably more ore than has been hoisted. We then have this ore in stock at its actual market value as determined from the previous year's prices, unless there should be a special reason for believing that the ore is worth less as was the case this year. In order to avoid double taxation and to discriminate between ore that is above ground we subtract the total value of the stock pile on the basis of the Lake Erie prices and the balance remaining is then arbitrarily placed upon the real estate. In other words, if a mine had a million tons of ore and the assessed valuation calculated was $500,000, all in the ground and no ore in the stock the entire value of the $500,000 would be placed upon the real estate. If there were a hundred thousand tons of ore in stock and say that this was valued at $1 a ton, the total value of the mine would remain the same. It would be classified as real estate $400,000, personal property $100,000.

There have been no special additional taxes placed upon mining in Michigan and I think there will not be. While there has been agitation for tonnage tax or occupational tax, something similar to that placed in Minnesota, so far it has not materialized in the form of legislation.

The method of appraisal is simply one to determine the value of the mine and determine as nearly as possible what we conceived to be the sales value.

MR. HOWE: Mr. Barrett, in determining the stock quotations, do you take the average amount bid or asked as the figure?

MR. BARRETT: I believe it is the average bid. That is done by the local supervisors and I don't have anything to do with it myself.

MR. ARMSON: Mr. Barrett, in your illustration you gave a mine valued at $500,000, and then if you have a stock pile valued at $100,000 you deduct the stock pile from the $500,000 and then assess the balance of the ore in the ground at $400,000. You then have 900,000 tons left in the ground. Originally you assessed it at 50 cents a ton, then after that 100,000 was taken out and the $100,000 deducted, you have $400,000 valuation on nine hundred thousand tons, or about forty-five or six cents a ton. Either your ore in the stock pile is over-valued or the ore in the ground under-valued.

MR. BARRETT: Well, that is probably true.

MR. ARMSON: I just wanted to know how it fits in the law or does the tax commission make a law itself?

MR. BARRETT: It is a ruling of the tax commission itself. Our whole idea back of this was to treat all of that ore as if it were in the ground, and this is purely an arbitrary method of handling the stock pile. It isnt a method sanctioned by law so far as I know, but the tax commission has quite considerable powers to handle a situation of that sort.

MR. ARMSON: What is the valuation of your tax ores in Michigan.

MR. BARRETT: One hundred and seventeen million dollars.

We have a little different situation in regard to ore than you have. Most of our mines in Michigan are underground mines. They are not fully developed and our experience has been that they have maintained about a constant tonnage over a period of the last 10 years. For instance, this year the total tonnage estimate was 205,000,000. In 1911 it was 199,000,000, so there is a slight increase in spite of an average production of about 12,000,000 tons a year. In other words, we have not reached the point where our reserves are being exhausted faster than they are being discovered.

MR. WEBB: Isn't one reason that the reserve stays constant because the mining companies are afraid to drill promising ground because of the taxes?

MR. BARRETT: That is probably true to a certain extent.

MR. WEBB: High tax may cause that situation.

MR. BARRETT: Under the Michigan law there is absolutely no other way that we could handle that.

MR. DICK: How do you value the mine in prospect that has no ore?

MR. BARRETT: Surface equipment. There is no value given to the mine itself. In the case of our Michigan copper mines, for instance, I might cite one like Victoria. It has been operating for 15 years. It has water power, a mill, and quite a lot of other equipment. It produces, I guess, about ten million tons a year, but it has been producing at a loss. That would be appraised under our system purely on the basis of its surface equipment and the value of that water power. The land itself is put in exactly the same as any other type of property.

MR. THACHER: You said you put no valuation upon it except on its equipment. Now if there is ore there that can be sold, wouldn't there be a valuation on that?

MR. BARRETT: It is operating at a loss.

MR. THACHER: Even if it is operating at a loss, doesn't it have a value?

MR. BARRETT: I don't see where ore has any value that is operated at a loss.

MR THACHER: Not that particular ore, but now I think if we come back to the question of values that the property must have a salable value.

MR. BARRETT: The point is nobody is able to determine what the sale value is in unprofitable property.

MR. THACHER: As I understood it, in 1911 when Mr. Finlay made his appraisement that was supposed to be the value of the mine. Isn't it true that now you make an annual appraisement?

MR. BARRETT: Yes, in the case of the iron mines.

MR. DICK: How is the life of the mine determined?

MR. BARRETT: The life of each property is determined precisely, I think, as they do in Minnesota, by the tonnage of ore divided by the rate of production as determined from experience of the mine in the past five years, modified, if necessary, by the appraiser's judgment as to any element which might tend to increase or decrease that rate of production. As far as the application of that system goes, it is purely up to the appraisers.

MR. THACHER: I would like to say in this connection that this idea of annual appraisement or estimate appeals to me very strongly. If we stop a minute to consider any property in its relation to its value, it has a value at one time, and the time is the element there; in 6 months or a year it may have a very different value. Now that is one of the reasons I have opposed this idea of taking the Utah copper or some other and saying that this valuation is for 25 years ahead. What do we know about 25 years ahead? We don't know anything about what it will be worth.

If you are going to come to values, I think you have got to make the value as of that year. We have that in the inheritance tax it is the value on the day you die and not some other month or year. I don't see how it is possible for us to talk about values 10 years ahead or 20 years ahead. We are just fooling ourselves on that. I heard some time ago that Michigan had come back to the annual appraisement and that seems to be a step in the right direction.

We are all confused in what value means. We don't use the same terms. We have ad valorem used one time one way and another time some other term used for it and after all we have a dozen different kinds of values that we are talking about, and it is really a question of definition. The government has a value for depletion and it has a value for invested capital and a value for inheritance tax and a whole string of them. Now we are injecting into that a valuation which comes from all these varied state laws and one puts it one way and another another.

I think to understand what we are talking about we have got to get some new word which means what we mean by value. Michigan has got one kind of taxation value and Minnesota another and Arizona another and the government half a dozen more for its different uses.

MR. ARMSON: I rather disagree with the gentleman. I think we all understand what value is. The trouble is the measure of value. I think value means the same in all those cases—state and federal—but the measure in determining the value is different.

MR. THACHER: Perhaps your point is well taken, but it is rather confusing to have half a dozen different ones get up and call it a different measure of value.

MR. BARRETT: Now I want to say this: this question of taxation is a practical matter. In Michigan the mining companies are very fair; I believe they are as fair-minded men as we could possibly meet.

The question of taxation in Michigan doesn't involve mining property only, it involves all sorts of property. If I want to apply the earnings' method to mines and capitalize that, if you wish, so that the mine only pays a certain proportion of the taxes based upon its earnings the previous year, your manufacturer, your farmer can come up and demand the same thing. Now farm property in Michigan this year hasn't made any money. I am not a farmer, but I have got a brother who is a farmer and I know he hasn't made any money. There are a lot of farmers in Michigan and they would be perfectly justified in taking the stand with the legislature "If you say that mining property can only be forced to pay taxes on the basis of the years when it actually produces, why then should I pay when my farm is a loss?" Now the farmer has to pay under this system. I am not holding any brief for the farmer, but I do believe that taxation is a matter that should be equitably distributed among all classes of people.

MR. THACHER: This question is complicated. The state laws vary so and you may have to change the constitution in order to get them more uniform in some of the states, but I think in our discussions here what we should try to get at is the main principles first. Let us decide those principles and then see how they can be applied or how they will work out in practice.

Now we have not only this confusion about the word "value" but the government and the different states tell us certain ways to derive that value. Now the one that has been forced on our attention particularly is this one in connection with income taxes. In our mines we have three factors to determine that really—the ore body, the cost of operation and the selling price. Now in regard to the ore body you may be able to determine the tonnage very accurately maybe for all practical purposes, but out of our 30,000 mines in this country there are very few that approach that. Many of them have no ore in sight and there is nothing to base that on.

Then you have the cost of operation as the second factor. That depends on labor, general conditions in the country, and

who is going to guess what our cost of operating any one of our mines is going to be 5 years from now? I wouldn't be willing to guess and I don't think any one else would.

Then you have your third factor, the selling price. What will be the selling price of copper 20 years from now? Can any one make a guess whether it will be 10 cents or 40 cents? I think we are building these on entirely artificial things and when you come and tell us that a certain mine is worth so much, based on that method of valuation, why we know as a matter of fact it is ridiculous, it doesn't come sometimes within gunshot of what that mine may be worth.

I don't see how you can get away from the fact that value, after all, is what the civilized world under favorable conditions will pay for it. We can go way back to the Supreme Court decision, and you remember their decision. It was a cardinal principle which we should never forget, that what property is worth for the purpose of sale it is worth for the purpose of taxation, and that is exactly what they try to apply in the inheritance tax. Now they have introduced, and it has been supported by the Supreme Court, that for the purposes of taxation they can have other kinds of values, but we don't want to forget that that is the right value. It is the only value that appeals to me and when we say the stock quotations are totally unreliable, possibly they are, but if you buy you will pay the stock quotations, that is the value that is placed on it at that time, and perhaps an entirely erroneous value.

To my mind that is very clear that that is what we understand in common terms as value and these others must have some kind of a name attached to them when we are talking about them.

CHAIRMAN MILLER: We had hoped to have here today Lieut. Governor Thruston Ballard of Kentucky. Kentucky is another state that uses a straight valuation method as distinguished from a proceeds method and it would have been interesting to have heard from him. Is there anybody here from Kentucky who has had experience with the way that operates from the standpoint of the miner or the government? (No response).

As to New York, it was hoped that the Honorable W. C. Witherbee could get here but I haven't seen him here. Is there any one else here from New York to take his place? (No response).

SECRETARY KRIEGH: We received wires that all of these men might be here today. They were not sure that they could get here.

Is Mr. Mackenzie of Utah here? Mr. Mackenzie, we just called your name hoping that you would be here. We are mighty glad you came in. We wanted you, if you will, to state

to the gentlemen what the taxes of your state are, how they are based, and how they seem to you to work.

MR. A. G. MACKENZIE (Utah): I am sorry, gentlemen, that I didn't get in touch with this meeting earlier, but due to some confusion on the program I missed it entirely this morning. I understand Mr. Dick said something about the Utah situation but I haven't any advantage of knowing just what he said and what I say may perhaps duplicate to some extent what Mr. Dick said, but in any event it won't take up much of your time.

Possibly I might give you briefly the evolution of our present mine tax laws in Utah. With the adoption of the constitution at the time of statehood, Utah and several western metal and mining states adopted the Nevada mine tax code, which in general provided for a nominal tax on the surface ground so long as it was used for mineral purposes, taxation of the physical property, the improvements at their value as other property and taxation of the net mined proceeds, arrived at by deducting certain expense items from the gross.

In the case of Utah, at that time and for many years subsequent, general property was assessed at say one-third of its value. As a matter of fact, 20 per cent would have been nearer the truth. In the year 1916, through an act of the legislature lowering the levy, a full valuation of the property was made necessary. Following that and in consequence of that the constitution and laws of the state were amended so that at present all property—physical property—is presumed to be assessed at its full value. All metal mines or mining claims, both placer and rock in place, shall be assessed at $5 per acre, and in addition thereto at a value based on a multiple or submultiple of the net annual proceeds thereof. All other mines or mining claims and other valuable mineral deposits including lands containing coal or hydrocarbons shall be assessed at their full value. All machinery used in mining and all property and surface improvements upon or appurtenant to mines or mining claims, and the value of any surface use made of mining claims or mining property for other than mining purposes shall be assessed at full value.

What I read there, gentlemen, is a constitution provision. The statute follows the language and under a provision providing for a value based on multiple or sub-multiple proceeds the multiple of the fee has been fixed and is now used.

The State Board of Equalization which assesses mining property in our state, except the surface ground, has made diligent and fairly successful efforts to bring other property up to full value. I think in the case of the public utilities, in the case of city realty and stocks of merchandise they have got pretty well up to a 100 per cent. They have not done so well with the

farms and never will, but it is a fact that they have farm values up to approximately 70 per cent for value.

Comparatively we are now in substantially the same situation that we were before the change in the law of 1919. You may be interested in knowing the deductions. They are given here briefly. We have a better definition of net annual proceeds now than we ever had before. There was always friction and disputes over deductions. For illustration, the old law never allowed a deduction of a general office expense. We will say a company (and this is more or less characteristic in our state) would have its property, of course, out in one of the mining camps and its general offices in Salt Lake City, and that, by the way, is the rule rather than an exception in our state. Under the old practice they would not permit the deduction of any of that Salt Lake City office expense which was a considerable and a necessary item of expense. Under the new law we are permitted those deductions, and as you will note when I read the deductions there are practical expenses except federal taxes and corporate officers, meaning presidents and vice-presidents and so on, but not including such officers as general managers, engineers, general counsel and so on, so long as they are residents within the state.

The deductions are these:

The amount of money actually expended during the year for labor, tools, appliances, supplies, etc., the actual and necessary office and expenses and salaries of employes, other than corporate officers within the state; the actual cost of the installation construction, maintenance and repair of machinery and improvements made during the year; the actual cost of reduction transportation and fee including sampling, as in smelting; the amount paid for state and local taxes during the year; the amount for compensation insurance.

Briefly those are the deductions allowed. I may say that we are reaching a better understanding in Utah with the tax authorities than previously existed. We find the position on their part to recognize some of the problems of our business which in former years we had great difficulty in bringing effectively to the attention of the taxing officials, and on the other hand the members of the Board of Equalization tell me that they are finding a spirit of reciprocity, if you wish to call it that, on the part of the mining men, and I think I can say truthfully that the relations there are better today than they have been at least for many years past in the state. The law, of course, is not ideal. No taxpayer will ever find a tax law that he regards an ideal I think, but they are fairly satisfactory.

CHAIRMAN MILLER: We are very much obliged to you. We have had some very interesting statements by gentlemen whose angle on it has been quite different. There are several gentlemen here who look at it from the standpoint of the tax-

payer's side. That is of vital importance because that is where the money has got to come from in the first place and we want to call on several of those gentlemen for brief statements of what their observation has shown as to the fairest and best method for assessing these mining taxes, not only from the standpoint of their own views, but what they believe to be the mutual standpoint. Mr. Frank Webb of the Republic Iron and Steel Company is one of these gentlemen.

MR. FRANK WEBB: Mr. Chairman, I am absolutely unprepared to speak at any length at all on this question. I just dropped in, but we are operating mines in Michigan, Wisconsin and Minnesota, and the system in Minnesota and the system in Michigan we think is fair and equitable and we think it works out in most instances very fairly. Our great trouble in Minnesota isn't with the system, it is with the rate of taxes that we have to pay. Now I suppose perhaps in no locality are mining companies burdened with taxes to the extent that we are in our Mesaba Range mine. That is more or less true in all groups of mining districts and that is largely due to the expenditures in those range towns and not the trouble with the system applied. In Michigan this isn't true to the extent of expenditures. We believe the system that is used there is worked out properly. We think the Michigan system of appraising stock piles is much fairer than the Minnesota system. In fact, we think that we are being hurt in Minnesota by this personal property tax. Now in Minnesota the law requires that personal property be taxed for 50 per cent of its true valuation. This year, for instance, we might have a stock on a certain property on May 1st of 100,000 tons of ore that was put up last winter, due to local conditions entirely, and acording to the state law the market value of this ore must be considered, certain deductions made, and then our tax based on this rate. It might be $1.50 a ton or it might be $2.00 a ton. We appealed to the tax commission only recently for some relief along this line that there should be a value placed on this ore other than the supposed market value because ore wasn't being sold at market value, it was sold for almost anything it could be sold for.

Now in Michigan we believe the system of taxing stock piles is much more fair to the operator. Personally, I would hate to see our system in either state change. The mining companies I believe are absolutely honest and square with the commissions in giving them every bit of information that they have on the properties. We are, of course, in Minnesota up against a so-called occupational tax—in other words, tonnage tax. It is made to hit the mining industry only and it is a super-tax. Naturally, we believe this is a gross injustice to the mining industry and is going to make a great difference in the mining operations of the state.

CHAIRMAN MILLER: Thank you very much.

We would like to hear from Mr. McGrath if he is here.

MR. T. O. McGRATH: Mr. Chairman, I don't think I have anything further to add. It has been very thoroughly discussed here.

Speaking of the taxpayer, I think there are other taxpayers here from Arizona who are paying a larger share of the burden than the company I represent. I think the system there of capitalizing net is probably as good as can be devised, considering the consensus of opinion as expressed here today. The only question there is arriving at the value in comparison with the values arrived at on cattle, stocks of merchandise, residence property and personal property. In other words, the only thing is to distribute the burden. I think the Utah plan is about the same as the Arizona, except that in Arizona they classify the mines which I think is an improvement over the Utah system. For instance, we capitalize the net at three times on some mines. It works an injustice upon some mines that are of short life and I think in that respect that the Arizona system is better than the Utah, but, of course, the Arizona system starts at 15 per cent and raises to 20, 25 and 33. I think that they have done their best in the matter and I think that probably a little improvement could be made in further classification and I think probably the rates are a little high for capitalization. I think probably 15 per cent might be all right for certain groups of mines, but I think that larger groups ought to go into 20 and others in 25 and 33 and I think some might go up even higher than that.

To illustrate the point: when they assess the value of merchandise at the end of the year they take the merchandise on hand at cost. Usually the merchant lets his stock run down at the end of the year and he tries to carry a very small inventory at the end of the year. That is a custom of the business regardless of tax methods and, of course, it is to their interest to have a small stock on hand at the end of the year and they probably make a further effort to reduce that stock towards the end of the year, so you might say at the end of the year the merchant has a smaller stock on hand than at any time during the year, unless business conditions were such that he was unable to reduce it, so you might say in some cases of some businesses that the amount of stock they had on hand at the end of the year in the ratio to the net to the year would be equal to about 60 per cent. Now they are capitalizing the mines at 15, 20, 25 and 33. I am convinced, just as a rough estimate, that the merchants are paying their taxes upon a basis of about 60 per cent capitalization. Of course, they don't pay it on a capitalization, you understand, they pay it on the stock on hand, but taking the figures and comparing them together it would be equal to about that, so you might say the merchant is getting the best of it. That applies also in the cattle industry, cattle on hand

at the end of the year, and a great number of other things, and it also applies to real estate. In some counties the real estate is assessed at coal value. In other counties where there is mining it is not. They have reasons for that. They say that real estate will not appreciate, it will depreciate, which is true, but still the people in those counties are dependent upon the mining interests for their living and the mines are contributing to their living and they should bear their proper ratio of expense.

Another point that Mr. Howe brought up there this morning about depreciation should not be included as deduction. I think that Mr. Dick was right in that. While some of the mines in Arizona have depleted all their original investment, a great number of others have not and if you determine the net of a mine without deducting the investment or the depletion of the investment—not the depletion of March 1, 1913, but the depletion of the investment—some mines will be overvalued or will get a net that is unfair when compared to other mines. If provision was made whereby the deduction should be taken, why those mines that have already depleted their investment would have no deduction to take, while those mines that had not the mines themselves it would equalize a certain unfairness, but those are all blind points you might say and the trouble down depleted their investments would get that deduction, so between there as the trouble in every other state is that this burden must be carried by the different groups of industry, by the cattle men, by the merchants, by the property owners and by the miners. Now the question is, can those groups get together and distribute that burden equitably. It is something that must be solved in your own state. You cannot solve it by uniform laws because those laws are made by representatives and each group gets its representatives up there just as strong as it can.

CHAIRMAN MILLER: We would like to hear from Mr. Zapffe.

MR. C. ZAPFFE: I would like to repeat about all that has been said by Mr. Armson of Minnesota and Mr. Barrett of Michigan and Mr. Webb and Mr. Hunner this morning but I don't think I will try to cover that. There is just one thing that comes to my mind that I think would be interesting to the gentlemen who have listened to the talks today and that hasn't been elaborated upon sufficiently. Now it may be from what you have heard that you have conceded a large discrepancy that exists between Michigan and Minnesota. In one way that may be true, but it is due to natural conditions that I think will eliminate the situation in the course of time, and that is that while in Michigan the mines are paying a tax of perhaps 20 cents a ton and in Minnesota at the present time they are paying a tax of 50 cents a ton is due to the fact that the tonnage is so very, very great, and that comes about through the fact

that in just one of the iron and ore producing districts in Minnesota the tonnage is so very large, and I refer particularly to the Mesaba Range. Years ago when explorations were started on the Mesaba Range, it was soon learned that it was possible to develop a very large tonnage with a small amount of exploration. The men were keen to develop a large amount of ore, they were keen to obtain a large number of properties. Mining was started in a small way by taking out ore in underground fashion and when it was realized that the tonnage was so very extensive and that the ore could be taken out by cheaper methods, the open pit method was developed and the ore was removed by the use of steam shovels. Now one of the necessary things in connection with steam shovels is that you have got to have lots of room and that meant the removing of a large amount of dirt. With such a large quantity of earth removed, it was found that a large amount of ore was on the property. When the time came to tax these properties, the greatest refinement was used in estimating these tonnages and it soon developed that the taxable value of the iron and ore jumped by leaps and bounds, and when the tax commission finally got to the point where they were using such extreme refinement that they said in their own mind that the iron and ore was valued at 100 per cent valuation, the figures of course became enormous.

In Michigan the mines were prevailing underground mines and they were developed with considerable difficulty. The explorations were very expensive as compared with the explorations in the Mesaba district, so after a certain small amount of ore was discovered, enough to justify gambling to the extent that you would sink a shaft and operate, the explorations ceased.

Now that all condensed in a few words means that on the Mesaba Range the total amount of reserves so far as exceeds the requirements for successful operation as compared with Michigan are very small, just enough to keep you going one might say, so we have, in fact, a situation in Minnesota that we have more ore than we really need, more than we know what to do with. However, when the tax commission reached the point where properties were valued to their fullest extent, the mining companies in analyzing the situation got to realizing that they had made a mistake in trying to develop so very much ore and the last 4 or 5 years has brought about a situation that explorations have been practically brought down to nothing excepting the few instances where reserves have to be developed.

A few years ago the total amount of ore reserves in Minnesota was roughly 1,500,000,000 tons. Today it is about 1,300,000,000 tons and that figure in my opinion will continue to decline for a certain number of years. Now many have taken the position that the ore is playing out in Minnesota and very recent statements have been made that probably ought never

to have been made that the merchantable ore in Minnesota will be gone in about 15 years. In my opinion that is not true. Just as soon as more reserves are necessary explorations will be resumed and more ore will be found. There isn't any doubt in my mind at all that there is a great deal more ore in Minnesota than it is possible to estimate at the present time. Of course that property cannot be put on the tax roll until the ore is known to exist. Now certain political organizations in the state of Minnesota have played up this fact to considerable advantage, have ridiculed the tax commission many a time and have made it appear that the tax commission is playing in the hands of the mining companies because we will say in 1914 the tax commission reported 1,400,000,000 tons and we will say 10 years ago it reported perhaps half that quantity. They say, "Why that ore has been here all this time and the tax commission hasn't put it on the tax roll." Nobody knew that wealth existed because it hadn't been developed, but just as soon as this total reserve of 1,300,000,000 is cut down to where we get the proper balance between what is necessary for mining, the reserves will begin to keep pace with the amount of ore that is extracted every year and instead of the iron and ore being depleted in the mines in the next 15 years, the probabilities are they are going to keep on taking ore out of mines for 100 years. At the same time new material is going to be made commercial which today is absolutely non-merchantable. The methods of improving ore are increasing so rapidly that material containing 35 per cent or 40 per cent of iron in some form or other in these ores will eventually be beneficiated in such a way that the ore will have a content not only equal to what our commercial ores contain today but even a better content.

Another point I want to speak about briefly is a matter that was brought up by Mr. Armson this morning with reference to the deposits of ore containing 20,000,000 tons which was stripped and made ready for mining and was never mined, but it is being taxed today at a high rate, as some of you men thought here today, although it was put in the reserves class—by that I mean not in the active class. One reason I want to speak about that is Mr. Armson made reference in his remarks to the fact that this certain large corporation was interested in the property and didn't want to have it appear that the tax commission was at all trying to lambast the large corporations. That is very true. I am employed by a corporation which has a very large organization. We mine in the state of Washington; we are the biggest coal miners in the state of Washington; we are the second biggest in the state of Montana; we mine ore in Minnesota and we have some properties on the Mesaba Range, and I am satisfied that the tax commission of Minnesota is not selecting the cor-

porations or the mining companies with any idea of being unfair to them.

Now in this instance the corporation referred to is the United States Steel Corporation and its subsidiary company which operates iron mines in Minnesota is the Oliver Iron Mining Company. Years ago this company acquired many, many properties and the general tendency was very much then as it is today not to buying property but to lease it. Settlers, homesteaders, timber workers and men of that kind were the men that were acquiring the properties and then later on leasing them to the larger mining companies. In the early days then the steel corporation had acquired some by purchase but the largest part of this property was acquired by lease. Two years ago the Oliver Iron Mining Company realized that the tonnage that it had on its leased properties was so great, that the period allowed for extracting these ores under the terms of the lease was gradually getting so short that it would be impossible for that corporation to take out all the ore to which it was entitled under those leases and the result was that it adopted the policy of not operating the properties which it owned and instead concentrated on its efforts in extracting the ore on these properties which it leased.

Up to that time the corporation had proceeded to strip this property with the large tonnage and then expose this ore deposit so it is absolutely exposed to view and there isn't any question about the tonnage there. Right then and there, in spite of the fact that they invested a large amount of money in stripping the properties, it discontinued its operation, but there is that large deposit which is there being taxed in the reserve list.

I merely mention that so you will not gain the impression that the corporations are being discriminated against by the tax commission.

I think as a whole we feel we are getting pretty good treatment under the ad valorem system. I think it is a good method to use in evaluating our iron and ore properties for taxation purposes. A few little things come up, of course, that aggravate the situation. One thing we dislike is the necessity of having our stock piles taxed with personal property. That is just simply a matter of fate, a condition of climate. The ore is piled in the winter-time not only to keep your organization intact, but to keep employment for the married men, keep their families going and keep the communities that are necessary around mines in good condition. Of course, with an open pit operation the sediment disappears and when the cold weather sets in everything ceases, no work is done at all until the ice thaws out in the lakes, and then the work is resumed, but in the meantime we stock pile this ore and we can't possibly get it out of the way by the first of May. If the period for assessment was the first of June, we could probably beat the game

and there is no doubt at all but what the mining companies would make an effort to beat that game just the same as the merchant will let his stock run down in order that his stock would not be the average of his stock during the year.

Our fight in Minnesota has largely been with the legislature. There has always been an attempt there to saddle extra tax burdens on iron ore. The mining companies have never attempted to provide any bill or legislation but have always combated whatever legislation has been presented. The result was that a few years ago property was classified and a bill was passed that put the iron ore in class one and thereby it is valued at fifty per cent of its full and true value. The last thing that happened was during the last session of the legislature the occupational bill was passed. There probably wouldn't have been such a severe fight against that bill if it was not for the mere fact that the only occupation against which the bill was directed was the occupation of mining.

Mr. George E. Holmes took the Chair.

CHAIRMAN HOLMES: I am sure we appreciate Mr. Zapffe's remarks. One or two points occurred to me in the course of his remarks and in the course of the remarks of Mr. Armson this morning which I didn't have occasion to voice, with respect to the ore which has been stripped but not mined and which is taxed a heavy rate. I should think it would be for the benefit of the state of Minnesota not to tax it at the present time to prevent this era of extravagance in the villages, and tax it at a higher rate when it is extracted at some future time. And with respect to the stock piles, I don't see those economical means of value, time and place value ought not to considerably reduce the value of stock piles below the market price that might be received the following spring if the ore can be sold at that time. Those, however, are merely observations of one who has very little knowledge of the practical operation of mine laws.

The meeting is now open for discussion by the members who may wish to comment upon the disorderly situation of our tax laws. We will no doubt some time reach a situation where those laws are more scientific and more equitable and more flexible than they are today. One great objection to all our tax statutes is that they are usually inflexible or the constitutions are inflexible. They can't cover special cases. A good deal of the complaint against tax laws arises from the taxpayer who has a special case.

I think it may be conceded that it is desirable that the taxpayers regard the tax officials as honest men, as Major Miller said yesterday, and that the tax officials regard the taxpayers as honest men as Judge Stimson remarked later on. No doubt, and without question that is the attitude between tax-payers and tax officials and the friction, if any, that does arise is due to some inflexible provision of the statute or some set practice or perhaps some fault in the underlying principles along which our taxing statutes are based.

We have gotten a great deal of valuable information in the meetings at this session of the Congress but only a small portion of the information that a body such as this Congress should have in order to advise or discuss or reason together for the purpose of improving our taxing system.

I think this is an opportune moment for any one who wishes to express his views on any particular statute or on the mining tax statutes in general to step to the front and address the audience. There are several gentlemen here that we haven't heard from and I am sure they have some valuable contribution to make.

MR. KELLY: With reference to the hardship that follows a reason of inflexible statutes and constitutional provisions, I don't know just what the Chairman has in mind but to my mind the protection of the taxpayer is guaranteed by an inflexible statute that gives him the same right and the same yardstick and the same measure that the other fellow has, and it is my judgment that there is too much tendency at this time in some of the states at least to make what they seek to term flexible statutes that may mean a different thing or may be applied in a different manner or different method according to the attitude of the taxing of property, and it is my judgment that the taxpayers' rights are better protected by constitutional provisions that are inflexible and furnish the same yard stick for everybody.

CHAIRMAN HOLMES: I think Mr. Kelly's remarks are very much to the point. What I had in mind was rather some degree of flexibility in the administration of a tax law that might be inflexible as to its limits but there has been a great deal of discussion on this subject of stock bills in Minnesota which I think even the Minnesota Tax Commission regards as being a rather unjust imposition or at least indicates that, since it has arbitrarily reduced the value of stock bills twenty-five per cent below what might be called their present cash value.

I see our friend Mr. Fernald has just stepped in. I wish to advise him that now is the time to speak or forever hold his peace. The meeting is open to a general discussion of our tax problems.

MR. H. B. FERNALD: I must apologize for not having been around earlier but I had a few little real problems that came up for consideration so as a matter of theory and principle I gave place a little while to them. It haven't had the opportunity to hear what has been said this afternoon but I have been very much impressed with what was said in the discussion yesterday and today in regard to the situation.

When I came on here I was expecting to hear what was the attitude of the various commissions and the various representatives in this matter of state taxation and we seem to be in a pretty general agreement that the mines must stand a very large amount of taxation in those states where they represent a large part of the state

wealth, and they must expect to bear their fair burden of taxation. On the other hand, there seems to be a general disposition on the part of the state commissions that have been represented here to arrive fairly and consistently at a basis of what the mines should bear and what they can bear without detriment to the industry and that the idea is not to penalize, not to injure, not to oppress any part of the state industry, whether it be mines or otherwise. I think we are all looking for the way in which it can be worked out along that line. It seems to me that we must look for that solution state by state for the time being at least, until we can arrive at some more general standard scheme of state revenue finance than we have at present or than we seem to have any hope of getting for a great many years to come. I think if we can just have the same spirit of cooperation to solve the mutual problems that we seem to have here today, and if we can all work on this matter of state expenditures, recognizing the bottom of the whole tax question is this matter of how much money is to be spent by the government, we will get our real solution.

I think we were all amazed at some of these figures that were given as to what some of these government budgets have run to. Five hundred dollars per capita is simply an impossible load. We can't run to that. Whether it comes from one system of taxation or another, it is too much. We are met with these demands in the states for all kinds of new expenditures, extension of activities, that cannot be met out of present funds and I think we must agree that they cannot be met at all without passing the danger point in the taxation, that danger point being the point at which taxes will become such a burden on industry that prosperity in the state is going to be injured.

Those are the principal thoughts that I have in my mind on this general question and I think it can be followed through and be given much more study to advantage and the tax committee of the Congress can do very excellent work on this matter. Perhaps this period of 15 or 20 years brings us to a point where we have worked out this ideal system of taxation for mines as well as all the other industries of the country.

CHAIRMAN HOLMES: By that time all the old reserves of Minnesota will be gone.

Is there any further discussion on this point of state taxation?

MR. A. G. MACKENZIE: I might say, to complete the information that we have pending now, to be voted upon next fall, a constitutional amendment providing for full classification of property and a graduated income tax but expressly exempting mines from classification. There seems to be a disposition in our state not to classify mining property. This exemption was not certified by the legislature. The amendment was killed twice in the House and once in the Senate and finally they put in this exemption I referred to and took it up and put it in the

Senate and put it through. It may sound as funny when I say it was killed three times and then passed, but what I mean is that it was practically killed in different forms. It will be voted upon next fall. Of course I can't predict whether it will be adopted or not. It may or it may not be. The people, of course, vote upon constitutional amendments.

CHAIRMAN HOLMES: Do you consider it a desirable change?

MR. MACKENZIE: I am not answering too rapidly on that. I am hesitating for the reason that I am not sure that state income taxes are a good thing as long as the federal government uses that means. My personal opinion is that the state should keep out of that field for some time at least. I don't believe in the classified property tax. Perhaps I am not a hundred per cent. disciple, but generally speaking I am not in favor of that. I think there is justification for certain forms of classification but you understand that this does not affect our property. The legislature seemed to be very much resolved itself on that question. This exemption was put in after the measure had failed three times and it then passed.

MR. ARMSON: I might say as a matter of information that in Minnesota at the next election we will vote on a constitutional amendment, in effect writing our new law into the constitution. There is grave doubt in the minds of some attorneys as to whether the so-called "Occupational Tax Law," imposing a tax of 6 per cent. on the value of the product of those engaged in mining, is constitutional. It was said this morning that we fully expect a fight up to the United States Supreme Court.

Now the majority of the legislature, anticipating the possibility of the law being held unconstitutional, put through a bill providing for a constitutional amendment writing into the constitution a provision permitting the levy of an occupational tax on mining in the state. Whether it will be adopted at the next election or not I don't know. Under our constitution, it requires a majority of all votes cast at the election to adopt an amendment, not merely the majority of those voting on the question but all votes cast at the election. I might say that as far as the occupation tax is concerned, it is not approved or endorsed by a majority of tax commissioners. The commission perhaps believes that iron and ore, because of its peculiar nature, because it is diminishing, that it does not reproduce itself, that when it is taken out it is gone forever and eventually we will have nothing left but holes in the ground, should bear relatively heavier taxes than other forms of property but we believe the state should impose that supertax in one system. We don't believe the state is justified in imposing two different kinds of taxes on the same property. For that reason, the commission, or the majority of the commission, was opposed to the occupa-

tion tax, but Mr. Mackenzie, referring to the constitution in Utah, brought to my mind the fact that we are going to vote in my judgment for a constitutional amendment. I quite agree with Mr. Kelly that I believe tax laws should be clear and definite in their terms and not left to individual caprice or whim. The matter of valuation is a question of judgment, of course, but the law should be definite and specific and the taxpayer, as Mr. Kelly said, is much better protected by a definite law than a law that is left to the judgment of the taxing officials. But at the same time I don't believe in writing statutory laws in the constitution of the state. I believe that you can trust as a general rule to the wisdom and judgment of the legislature to enact laws to meet conditions as they arise from time to time. In our case where we require a majority vote to amend our constitution, if we write what properly is a statutory law in the constitution and conditions change in two or three or five years, we can amend that without going back to the people to get an amendment to our constitution, so I don't believe in writing statutory laws into the constitution.

CHAIRMAN HOLMES: Are there any further remarks on this subject? The secretary of this meeting has requested me to state to the members briefly the recent developments in Federal Income and Excess Profits Taxation so far as that affects the mining industry. I have in my hand a copy of the Revenue Act of 1921, which may become a law in 30, 60 or 90 days, depending upon how bitter the opposition to the Administration Bill develops to be. At the present time the Senate has agreed to a number of so-called compromises and amendments, some 77 of them, and the leaders of the House have announced their intention to fight these amendments and insist upon some of the original provisions of the House Bill, particularly in provisions reducing surtaxes to a maximum of 32 per cent.

It is very unlikely, therefore, that this bill will become a law before the end of November, possibly the end of December, and possibly we will have a law again passed in January to apply retroactively to the preceding calendar year. This bill does not make any material change in so far as the law affects the wasting industries.

The provision for depletion is retained with a slight and very reasonable modification in the case of depletion based on discovery values, that modification being to the effect that the allowance for depletion based on discovery value shall not exceed the income from the particular property discovered, unless the income from the particular property discovered is not sufficient to cover depletion based on cost or on the value as of March 1, 1913. I think Mr. Thacher was perfectly right in saying a little earlier this afternoon that we do have several kinds of valuation and it is more than merely a measure of valuation, it is valuation of very different times and

under very different conditions. For state tax purposes, of course, we speak of current values, valuation on the assessment today. For the capital stock tax, invested capital under the federal law, we speak of value, meaning the actual cost to the taxpayer, which might be $15,000 for a property now worth a million. For depletion it may be that very same $15,000 or it may be a valuation of his property on March 1, 1913, a peculiar temporary provision due to our federal constitution, or it may be his value 30 days after discovery and special inducement granted to the prospector or wild-catter to go ahead with the new natural resources during our period of high taxation so that we have more than a mere difference in the measuer of value. It is a real difference in value. It is a difference as to point of time and the value on which state taxes may be assessed, not the value in point of time on which invested capital is based or upon which depletion may be based.

As I said, the depletion clause is not materially changed, it has this one limitation and no one can quarrel with that. The excess profits tax is proposed to be re-enacted for the year of 1921 practically without change. Gold mining companies are exempt from this, as they were under the revenue act of 1918, and in the case of the sale of mines, the same limitation on the tax, namely, 20 per cent. of the selling price, is contained in this law. The limitation in the case of the sale of mines by individuals is also retained in that portion of the income tax law relating to surtaxes, the limit being 20 per cent. for the year 1921 and 16 per cent. of the selling price for the year 1922 and thereafter.

This change is due to two things. First, there is a reduction proposed by the Senate Finance Committee to 32 per cent. as the maximum surtax rate, which, plus an 8 per cent. normal tax rate, would equal 40 per cent. and be the highest rate payable by an individual. Then there is another new provision in the statutes referring particularly to the taxation of profits on the sale of capital assets. It has been recognized for many years that it was decidedly unfair to the taxpayer to impose a tax upon the profits he made on the sale of his capital assets at the rate of surtax which was intended primarily to measure the amount of tax which capital could earn in a twelve month period when he may have held this very property for a period of several years. Our surtax rates went up to 70 per cent., practically. The result was that men would not sell their properties as a whole, new alignments of capital were prevented because no man felt that he wanted to be taxed at a maximum rate of approximately 70 per cent. on the profit which he may have got ten in the year of sale but which really was the profit gained over the period of many years, 5 or 10 years perhaps, so the Senate has tried to remedy that situation by providing that where a man has gains from the sale of capital assets, the net gain, which shall be the selling price minus the cost, or the value on March 1, 1913, and such expenses as are clearly applicable to the sale of the property,

that capital net gain, or profit, shall not be taxed in full but only 40 per cent. of such profit shall be included for the purpose of the income tax on individuals, or corporation tax on corporations. That provision, however, does not go into effect until 1922, so that if the maximum surtax rates remain at 32 per cent. of the normal and the normal tax at 8 per cent., the highest rate could not be more than 40 per cent. and if that is applied to only 40 per cent. of the capital gains, the highest rate of tax that a man would be called upon to pay upon the sale of his capital assets would be 16 per cent.

In the case of corporations paying a 15 per cent. income tax, which is the rate proposed for 1922, on 40 per cent. of the profits arising from the sale of capital assets, it would leave a net tax of 6 per cent of their profits to the federal government. This is an attempt to remedy a situation that everyone has deprecated for several years and is a considerable step in advance of the development of our federal income tax system.

I do not recall any other provisions specifically affecting the mining industry. There are other provisions of a remedial character, such as those relating to exchange of property. Under that law an exchange of property for property will not be subject to income tax or excess profits tax unless the property received in exchange has a readily realizable market value. Just what is meant by "readily realizable" is perhaps a question for discussion and construction and interpretation. I think the intention of Congress was to approach this general rule, which perhaps the courts may lay down with respect to our present and past income tax laws, that unless a man receives in exchange for the property he surrenders, property of a kind and in an amount which he could without question go out and sell at a definite price within a reasonable time after the exchange took place, then he should not be deemed to have received something which is the equivalent of cash.

That would apply to a man who received liberty bonds in exchange for property but it would not apply to a man who received several hundred thousands of dollars worth of shares of stock upon the incorporation of his business because it might be plainly evitable, even though there was a market for some of that stock, that he could not go out and sell all of it and that stock is not worth to him the equivalent to a market price on a small amount of stock which might be sold. The Senate and the House, to go a step farther in treating the question of exchange, provide that not only must the property received in exchange have a readily realizable market value but even though it has a readily realizable market value, under certain conditions it shall not be taxable in any event, and those conditions are that when any property held for productive use in trade or business not including stock in trade or other property held primarily for sale, is exchanged for property of a like kind or use, no gain or less shall be deemed to arise. One manufacturer may have a certain kind of machinery and another a differ-

ent kind and they may find it desirable to exchange. Perhaps A has gotten the better of B on the exchange but nevertheless the law specifically states that no gain or loss shall be deemed to arise in such a transaction.

Secondly, no gain or loss shall be deemed to arise in the case of a reorganization of one or more corporations where a person receives in place of stock or securities owned by him stock or securities in a corporation and party to or resulting from such reorganization. In any reorganization which includes the reincorporation of a company or the merger or consolidation of two or more companies, the statute now specifically provides that no gain or loss shall be deemed to arise.

The 1918 Act and the preceding acts have given rise to a great deal of controversy on the question of how much richer a man has become because he incorporated his business. This will exclude all that controversy from the income tax law in the future.

The third instance where this exemption is made is where a person, or two or more persons, transferred property which he or they may own, to a corporation. In other words, where they incorporate a business. In that case no tax shall be imposed even though the stock received in exchange may be said to have a readily realizable value. Congress has tried to weed out of taxable profit any alleged or apparent profit or to take out profit which might arise on an organization or reorganization or any exchange of property used for productive purposes in a business, their position being that those are not transactions primarily intended for realization of gain but they are realignments of capital in the case of organization or reorganization or substitutions for the more expeditious construction of business in the case of other exchange.

Then there is another provision that where property is compulsorily or involuntarily converted into cash or its equivalent where a man has to, by reason of condemnation proceedings or loss or anything else, involuntarily get his money for his property, he will not be taxed if he takes that money and spends it on similar property performing the same function as the property which was taken away from him, or destroyed.

In all of those cases the property received in exchange for the property surrendered shall be deemed to be a substitution of the assets of a taxpayer. He can ascribe no more cost or value to the new property than to the old. He merely postpones his final accounting for income tax until he actually does sell the new property for cash or the equivalent of cash.

A further provision in that connection is to the effect that where a man exchanges property, exchanges stock, let us say, of one corporation for stock in a merger, he may receive a little cash also, and in such cases the cash is not deemed to be profit but goes to reduce the cost to him of the investment, unless the cash received exceeds the cost to him of the investment, in which case the excess

of cash shall be deemed taxable profit and the new stock will cost him nothing.

There are a number of changes of an administrative character in the law, too many of them to go into it at any great length, and perhaps of no particular interest to this audience. These, I think, are the principal changes which will be made in the statute when it is passed, provided no amendments are made and no compromises and amendments that have been introduced have not materially affected the law in these respects.

In addition to the Revenue Bill introduced by the Ways and Means Committee originally, a number of bills have been introduced that have some interest to the mining industry and some of them, if there was any serious danger of their passing, would constitute a serious blow to owners of natural resources. The best known of these bills probably is the Ralston-Nolan Bill, House of Representatives 12397, which is a measure introduced into the House of Representatives proposing to impose a tax of 1 per cent. on the privilege of holding land and natural resources—coal, oil, minerals, timber, water power, etc. Only land in excess of $10,000 in value, irrespective of improvements is intended to be taxed thus, relieving the ordinary farmer and small holder of city property. This, of course, is a single tax and class legislation and will no doubt retard the economic development of the natural resources.

There is some considerable propaganda issued in favor of this bill and some considerable support of the bill but at the present time the chances seem to be that the measure will not become a law. Of course, if such a bill became a law, we would have all of the administrative difficulties of valuation that we have been discussing for the last two or three days.

The Keller Bill is another proposal along the same line as the Ralston-Nolan Bill and Mr. Keller has also introduced a second bill proposing a differentiation between earned and unearned income, classifying as unearned income, income derived from rents of land or other properties, which includes rental from mines. This bill proposes that the surtax rates on earned income shall be one-half the rates prescribed by the revenue account of 1918 and the surtax rates on unearned income shall be twice that amount.

Senator Pittman has introduced a bill in the Senate, Senate 233, to extend the exemption from excess profits tax now granted to gold mining corporations so as to embrace corporations engaged in mining, milling or reduction of silver.

Senator King of Utah has introduced a bill, Senate 2007, with the exemption of gold mining corporations from the excess profits tax under the Revenue Act of 1918 shall be extended to any tax imposed by Article II of the Revenue Act of 1917, and assessed but remaining unpaid. Apparently it would not apply to those who have paid their taxes but those who had been assessed and had not paid them. It is rather serious premium on delinquency.

Senator King also announced his intention a week or ten days ago to abolish depletion altogether in the calculation of net income of mines and other corporations having natural resources but I understand he has recently stated that he will not introduce that measure and if he should, of course it is entirely improbable that any action would be taken on so revolutionary a measure as to abolish depletion altogether after what the Supreme Court has said on that.

If there is no further discussion of the Federal Revenue Act, I shall ask the permanent Chairman to take charge of the meeting.

MR. ARMITAGE: I would like to suggest a resolution before the meeting adjourns. We have had a very interesting and thorough discussion of the question of state taxation. A great deal of this discussion, I am afraid, will be lost if we do not put it in some concrete and definite form. Now my idea is this, that we should recommend here—we can't pass a resolution as we are only a subdivision of the Mining Congress, but we can recommend to the Committee on Resolutions of the Congress that they pass a resolution and here is my suggestion—that we recommend to the Committee on Resolutions that the Congress pass a resolution reading as follows:

"RESOLVED, That the President of the American Mining Congress appoint a committee of not less than 10, with authority to increase its number, to study the question of state taxation of mines within the United States; that this committee be empowered to collaborate and act with a similar committee appointed by the American Institute of Mining and Metallurgical Engineers and make a joint report of their study and research, said report to be delivered to the Secretary of the Congress, and to the Secretary of the Institute as soon as possible."

Now those committees would get together, make a careful report, collaborate and systematize what we have collected here and distribute that report among the members and we could have the substance of this and such further investigations as they would make with the aid of some of these officials from the various states who have been so kind as to come here and give us their full information and knowledge and their reports. We could give a very comprehensive report and study of this subject of state taxation. Before this meeting, Mr. Kriegh and I went through all the libraries to find if there was any such book written and the only one we could find was written several years ago by Professor Young and that is of no value because the laws have changed so and altered in all the states. It does not give any idea of the subject and therefore I thought a committee of that sort working hard and conscientiously, in the next three or four months, or less than that, could get out such a report. It may say that I have talked with various members of the Institute and the president of the Institute and he is fully in accordance and in favor with the appointment of such a committee and will recommend it to his body. He is in accord and I am quite sure they will follow his recommendation. Therefore I propose such a resolution.

CHAIRMAN HOLMES: Before putting the motion to the meeting I would like to say a word or two about this. I don't see how the American Mining Congress could render a greater service to the mining industry on this phase of its many activities than to gather together the available data, data which exists in many places, if in no other place, in the minds of the members of tax commissions and of taxpayers, get the available data together so that we will have a definite premise on which to reason together again next time the Congress meets, and which can be distributed for discussion and consideration among those who give time and thought to tax matters. Will somebody second the motion?

The motion was seconded by Mr. Kelly and was carried.

CHAIRMAN HOLMES: I have been acting as temporary chairman of the meeting in the absence of your much more able permanent Chairman and will now step aside and let the permanent Chairman take the chair.

Mr. Armitage then took the Chair.

MR. FERNALD: I think before we adjourn we should register a vote of thanks to the delegate from Mexico and to those members of the state commissions who have been good enough to take their time and give their effort in presenting the subject to us so carefully and from which I know we all feel we have so greatly benefited, and that the Committee on Resolutions of the Congress be requested to spread this in the resolutions of the Congress on behalf of this division.

CHAIRMAN ARMITAGE: Gentlemen, you have heard the motion. Is there any discussion? If not, all those in favor please say "Aye"; contrary "No." The motion is carried.

Is there any other business before the meeting? If not, a motion to adjourn is in order.

MR. HOLMES. I move we adjourn.

The motion was seconded and carried and the meeting adjourned at 5:10 p. m.

Mr. A. P. Ramstedt of Wallace, Idaho, being unable to attend the Tax Conference, submitted the following communication to be placed in the record of the proceedings:

"I regret that important business coming up unexpectedly at the last minute prevents my attendance at the Chicago Convention of the American Mining Congress convening on Monday next.

"The Mine Operators of this district are much interested in the subject of State and local taxation of mines to be considered at the Mine Tax Conference, and as I will not have time to prepare a statement of our views on the subject, I submit the following report of my discussion of the subject following the submission of the Report of the Special Committee on Mines Taxation of the National Tax Association at Salt Lake City, September 10, 1920, which report advised the ad valorem system of state and local mines taxation:

I question the advisability of this Association giving its endorsement to any idea or scheme, for general application, in the matter of state and local taxation of mines. From a purely administrative standpoint the assessment of mines in states like Michigan and Minnesota, where the deposits may be quite readily measured and valued, may be quite simple, as compared with the assessment of the deep fissure mines in states like Idaho and Montana. The members of the main tax committee of this Association, and most of us here probably are aware of the wide diversity of opinion on this question. This diversity of opinion arises as a result of the differences in the conditions surrounding this industry in the several districts throughout the country as a whole. There is such a wide divergence in the product mined, in the value of the product, and in the surrounding conditions, that I am inclined to believe that the subject may more profitably be treated from the standpoint of each state, rather than from the standpoint of the nation.

I have given the subject of mine taxation in Idaho a great deal of thought, as a public tax official and as a private citizen, and I believe that as far as our state is concerned, a tax on net profits is the most equitable tax that may be applied to ore itself. If we must have a nation-wide scheme, I believe that the net profits tax is the most equitable tax that may be applied to this industry, as well as to all other industries of wasting assets.

The benefits to be had from our material resources are not measured by the public revenue that may be derived therefrom or thereon. The welfare and prosperity of our people here in the west depend largely upon the development of our material resources. To tax this class of property on its full value, I believe generally results in excessive taxation, and, if so, would be an obstacle to investment and development. To impose a tax on the full value of this property, annually upon the ore, is to load this ore down with its annual charge, during its entire life, to be met with eventually out of the sale of the property itself. This property does not produce income, in the sense that farm lands produce income. When the ore is eventually taken out and sold it is gone; it cannot be replaced. There is no new crop coming in. I believe that a tax on this class of property should bear some relation to income, not necessarily to value.

No one with his eyes open is going to invest money in mining, in states like Idaho, where the initial investment is so great, where the returns are so far in the future, and where the hazards are so great, and take a chance on the entire profits, or a great portion thereof at least being taken from him. I believe, that the tax officials in my state, who have given this matter consideration, agree that under our net profits tax law the mining industry is bearing its full share of the load.

In our state the lands and mining claims are assessed on the ad valorem basis, the land itself being assessed at the price paid the government therefore; all machinery and equipment improvements are assessed at full cash value, and then the annual net proceeds are taken as an additional assessment value, for purposes of taxation.

"In this connection I beg to also submit the following report of the discussion of the subject at the Salt Lake City Conference by Mr. Samuel Lord, State Tax Commissioner of Minnesota:

I have probably given as much thought to the taxation of mining properties as any other man in this country, and it is my deliberate conclusion that the only real way of taxing mining property, that approaches anywhere near a scientific method, is by means of an output tax. Unfortunately so many of the cities and villages that have sprung up on the iron ranges in Minnesota have come to be so dependent upon

the mining properties for their support, that to deprive them of the general property tax and compel them to obtain their revenue in any other way, would knock the props from under them completely, would lead to chaos and would be most unfortunate; and so no member of our commission has ever advocated the adoption of an output tax for the mines in Minnesota that the local communities would be compelled to depend upon for their revenues.

We believe that any change in the taxing system must leave to the villages, cities and towns the ad valorem system of taxation for the support of their schools and for the support of their local governments, but I do not know of any good reason why the state is not fully justified, if it sees fit, in obtaining its revenues from the mines by means of an output tax. I am confident that it can be proved conclusively that in a long series of years—say 40 or 50—the mining companies, by paying an output tax to the state, which would be no more burdensome than the state taxes they now pay, would turn into the state treasury a very much larger amount of revenue than they will be compelled to pay under a general property tax.

The ability of a mining company to pay taxes depends upon its profits, and its profits depend, of course, entirely upon output. If an output tax were imposed upon the mines of Minnesota which would produce no more revenue than they pay the state today, in the end they would turn into the state treasury a much larger amount of money than they would under a general property tax. The correctness of this statement is so evident that it needs no elaboration. The known merchantable tonnage of iron ore in Minnesota is approximately 1,300,000,000 tons. We are mining on the average about 37,000,000 tons a year, and if no more merchantable ore is disclosed (a thing which is, of course, unthinkable) the mines will be exhausted in about 37 years. The mining companies paid in state taxes last year approximately $2,300,000. With an output tax, having a rate that would yield the same amount per annum, at the end of the 37 year period they would have paid in taxes in the neighborhood of $84,000,000. And they would be just as able to pay $2,300,000 in taxes the year they take out the last 37,000,000 tons as they are to pay that amount today. Under the general property tax, if the state rate remains the same—and of course we hope for it to decrease rather than increase—the taxes from the mines will decrease about 3 per cent a year until they reach the vanishing point. Of course there are many factors I have not taken into consideration that will necessarily change, to some extent, the figures I have given, but such figures are sufficient, I feel sure, to demonstrate the points I am endeavoring to make; that an output tax from the standpoint of the state is a much more desirable form of taxation than the general property tax, and, if the rates are fair, that it will impose no unjust or unusual burden upon the mining companies. For these and for other reasons that I shall not trespass upon your time to give. I have always been in favor of an output tax for state purposes, in lieu of the general property tax.

"There can be no doubt that the discussions and treatises at our annual conventions of all questions pertaining to taxation of state have been of greatest value and this applies to the discussion of state and local taxation of mines. However, as there is so wide diversity of opinion on this question, arising as result of the difference in conditions surrounding mining in the several states, I again urge the inadvisability of The American Mining Congress giving its endorsement to any scheme for general application in the matter of state and local taxation of mines."

National Oil Shale Conference

OPENING SESSION

TUESDAY AFTERNOON, OCTOBER 18, 1921

The first session of the National Oil Shale Conference, held in conjunction with the American Mining Congress at Chicago, was called to order at two-forty p. m. Tuesday, October 18, 1921, by Dr. Victor C. Alderson, President of the Colorado School of Mines.

CHAIRMAN ALDERSON: Gentlemen, in opening this conference, I wish to say that I feel the importance of suggesting to you, at the beginning, that in these matters we are at the beginning of a very great movement. To me, the movement seems to be a most striking one—the most important one on the industrial horizon—not merely for those who are here this afternoon, but for the entire world. As I have vision to look ahead, I feel that if our industrial life and our civilization depend on one element more than any other, it is fuel. I will not take the time of the gentlemen, who may speak from the floor, or from the speakers, who are on the program, but I cannot let the opportunity pass without calling your attention to a few striking facts.

In the first place, leaving out of account the situation as we find it in this country, which has been told and re-told many times, the oil shale industry in Germany (as a result of the great war) is going forward with gigantic strides. Before the war, Germany imported its oil from outside fields, chiefly the Baku. When that field was shut off she looked to some domestic supply. She found it in the oil shale deposits of central and southern Germany. These are now being developed rapidly in order to supply Germany with a domestic supply of crude oil, and relieve her of the necessity of importation.

In another European country the same circumstances have arisen. In 1916, Russia found that she needed a large supply of oil; her imports were shut off. It was found that in Esthonia (probably few here, if any, know where Esthonia is; it is one of the new Baltic states of old Russia) the use of oil shale has exceeded, with the possible exception of Scotland, its use anywhere else in the world. On the Gulf of Finland the outcropping is very pronounced, running to a hundred feet or more in thickness, and slopes southward at a slight dip, so that the oil shale is accessible over an area of many square miles. That deposit comprises the chief natural wealth of this new state. Fifty-four thousand tons were mined last year in open cuts by steam shovel methods. It has been used in its crude state for fuel in houses, in manufacturing plants, and on locomotives; now

they are in the process of retorting it and getting the crude oil. Just before I left home I received this bottle of their crude oil. Here it is, in a box with the hieroglyphics in the form of postage stamps on it, to show its genuineness.

In other parts of the world, also, the oil shale industry is advancing. In Brazil, where they have large natural deposits of iron, but little or no coal or oil, they have an out-cropping of four hundred miles of oil shale; experiments are going on to make it the national fuel.

In Australia, in New South Wales, the industry has been going on since 1865. Several million tons of this shale have been treated with more or less success and failure, until, at the present time, as I understand it, the industry is on a commercially profitable basis.

Perhaps the most striking of all, and the thing that will be of intense interest to you, is what is going on in South Africa. The African Oil Corporation has been developing the oil shale deposits in Natal. Their property has been examined by the engineers of no less an organization than the Royal Dutch crowd of oil fame, who have taken a six months' option on that great deposit. When the Royal Dutch crowd goes in, on the advice of their engineers, with the millions they have behind them, I think we can fairly assume that the tide has turned, and that other great financial interests will soon turn their eyes towards our own oil shale deposits.

My address will appear in full in the proceedings of this conference. I would call your special attention, however, to the succeeding part of my remarks. I will take just a moment to read the conclusion, because I should like to have it clear in your minds as a basis of what may go on this afternoon.

"A comprehensive and world-wide view of the situation suggests a few striking facts: (1) The supply of petroleum cannot be depended on to supply, indefinitely, the needs of industry for oil and its derivatives; (2) The oil shale deposits thruout the world are virtually inexhaustible, and supply a second line of oil defense."

The main problem to be solved is the perfection of a retort of large capacity, fool-proof in operation, designed on scientific principles, that will produce the maximum amount of crude oil.

The second problem to be solved is the refining of crude shale oil, not into a long list of chemical curiosities, but into a few standard products for which there is a steady market.

Third, the co-ordination of the various elements so that, as a business project, the whole will be an economic success.

Finally, there is a world wide interest in oil shale—an interest that is financial, economic, chemical, and practical, that augers well for its early development into an important factor in the economic advancement of the entire world.

Our program for the afternoon consists of two short addresses —the first by a gentleman with whom we have considerable enjoyment because we, in the west, have been talking about oil shale as if

Colorado was the only place where it could be found. This gentleman says that Colorado is not "the only pebble on the beach," that there is another region that must be taken into account. It is proper that it should, because the matter we are considering is one of world wide importance for everybody. I take pleasure in introducing to you, Mr. S. E. Barnwell, of Cincinnati.

Mr. Barnwell then read his paper. It appears on page 485.

CHAIRMAN ALDERSON: Our next speaker is a chemical engineer of international reputation, who brings to us a message of vital importance. I refer to Mr. Lewis B. Skinner, of Denver.

Mr. Skinner then read his paper. It appears on page 487.

CHAIRMAN ALDERSON: To expedite matters I should like to suggest that a committee be appointed for the purpose of deciding on the number of committees required, and to nominate members.

A motion to that effect was made, seconded, and carried.

CHAIRMAN ALDERSON: It has occurred to me that there must be questions in the minds of many of the gentlemen here, that they would like to propound, and there must be others who could answer those questions, so it occurs to me that it would be a good plan to put ourselves into the position of an informative body. I have a question in my own mind that I should like to ask, and I think it can be answered. What is the advantage in diamond drilling oil-shale land?

MR. ROBERT LONGYEAR: Doctor Alderson has apparently called on me because my company has just been doing some diamond drilling in Colorado oil shales for two different concerns. I don't know just exactly what he wants answered on this question except that the work we have done, so far, has been very satisfactory, for these two concerns. In one case, we took out a four inch core, and split that core into two parts; we then took one-half and split it again; then we had two independent runs made for analysis. As far as the analysis, or value of their property is concerned, I can tell you nothing, for I have no information whatever on the value of oil content, except over in our booth, No. 29, we have three specimens of oil shale, and are going to have analysis made of them. As I take it, this is not a meeting for propaganda, and I am not going to stand up here and give arguments for diamond drilling, but will be glad to have any of you visit us in Booth 29, and take up any questions with us, for we think it is of great value to oil shale people.

CHAIRMAN ALDERSON: Those of us who have been out in the western hills, and have tried to sample oil shale exposures, and know what it is to crawl up the side of a hill with a hammer and moil, to get an exposure, with nothing to hold onto except our eyelids, and try to get a sample of shale, and find out what the value of it is, will realize the tremendous importance of a diamond drill that will put down a hole one thousand feet deep, and give an exact record of every stratum passed through. I want to point out that in the examination of our oil shale lands, the matter of knowing the thick-

ness of each stratum, and its quality, is of the utmost importance in the valuation of our lands. If I had at my disposal a number of thousands of dollars to use for the valuation of oil shale lands, I believe I would put it into diamond drilling, because of the accuracy of the information obtained.

The Chair is open for other questions.

MR. M. C. HOLLEMS: While we are on this question of diamond drilling, I wish to say I represent the H. R. Ameling Prospecting Company of Rolla, Missouri. It appears there is a great deal of interest at this time, among oil magnates, regarding the value of diamond drilling. Our company is weekly receiving inquiries, and in a number of cases requests, to submit bids on diamond core drilling in the oil fields. Now, it would seem to me that if diamond core drilling in the oil fields is of value, it certainly would be of much more value, or at least an equal value, to the oil shale fields. I am very glad to know that Mr. Longyear's people have been doing some work along this line. We are seriously contemplating entering the oil fields with diamond core drills. It is of great interest to me to learn what he has to say concerning their experience in the oil shale work, as also your remarks. I thank you.

MR. BARNWELL: This thing seems to be largely western in its tone. I should like to inject a little Kentucky enthusiasm into it. I make this statement for the reason that, unexpectedly, I find a very able ally at hand. Prof. C. S. Crouse, of Lexington, Kentucky, is here. He does not want to speak, but I should like to have him speak.

PROF. CROUSE: I hardly expected Barnwell would put anything like this on me or I would not have sat down beside him. As Mr. Barnwell has pointed out, apparently the Rocky Mountain section is getting all the publicity. We have, in Kentucky, everything that occurs in the western section, and a little bit more. The only thing we can concede is that the western shale probably averages more oil. The whole state of Kentucky is underlaid with shales, outside of the blue grass region, untold millions of tons that can be mined by coal mining methods. At present, ample railroad facilities are at hand; Kentucky is in the center of the population of the United States; the labor question, then, is not such a serious one; water is plentiful in nearly any place thruout Kentucky. The shales lie in the form of a rough semi-circle around Lexington, even running up to Lowell. The climate is good; there are no hard winters; the shale crushes, at least according to my experience, more easily than western shale. You will, of course, have to allow a little for enthusiasm for our own shale, but, take it all in all, I believe we have something in Kentucky that most of you do not know about—haven't heard about—but if you could see the thickness and accessibility of it you would open your eyes. I certainly do wish you could all come down to Kentucky and see it. (Applause.)

MR. J. A. EDE, LaSalle, Ill.: I was asked a few days ago, to discuss some topic, and I am supposed to take up oil shale, but couldn't

make anything very technical. Mr. Ede then read his paper. It appears on page 503.

CHAIRMAN ALDERSON: There is room for everybody in the oil shale industry; there can be little or no competition. The only difference between Prof. Crouse and Coloradoans is that we "have got the jump on him"; that's all. He is now in the fold, and we will all march together, and keep step. I have long felt that a great deal of attention should be given to the eastern oil shale deposits, thru Kentucky, southern Indiana, Ohio, and Illinois. This matter is so broad that we should not neglect any deposit in the entire United States. It might be well to remark, just at this time, that those who are afraid the oil shale work will supplant the well oil industry, should bear in mind that they are misusing the English language. In the minds of those who are best informed, "supplant" is not the word to use; it should be "supplement," because whatever is done, naturally will be, in the first place, of a local nature, and only a local demand will be supplied. I think, however, that I would not be doing my duty if I did not call your attention to a gentleman who is here, who should be regarded as the Dean, you might say the Patriarch, of this movement. He is rather too modest to get up on his feet and talk, of his own accord, so I am going to take it upon myself to call upon this gentleman, who has probably spent more money of his own in this matter, and knows more about telling us what not to do, than anybody else. In oil shale matters his name is one to conjure with. I have tried every means I could think of to get something positive from him, but it is always a negative answer that he is "not ready." Even though he is not ready to tell us what we ought to do, he should be ready to tell us a few things we ought not to do. I refer to the Patriarch of this oil shale industry, Mr. R. M. Catlin, of Franklin, New Jersey, and Elko, Nevada.

MR. CATLIN: I suppose I am a Patriarch, in a way, having spent some fifty-eight summers in this "vale of tears" and half of it chasing a rainbow. Many years ago oil shale was called to my attention, and I realized, as I think most of us do, the potentialities and great attractiveness in the shales of not any one section, but in the shales of the world. I got into it, and it got into me. Now, as Dr. Alderson has said, many times people have written me (hardly a mail goes by, or a week goes by, that I do not receive a letter from some place on earth) asking me to give them the details of my process. That is a pretty hard thing to answer. I am sure I can not say that there is any one process that is going to work for them all. Perhaps, as you struggle along, you find that there are a great many surprises, and as you go on, you will find that "a great many things ought to be so that ain't, and a great many things ain't so that ought to be."

I have thought I have pretty nearly arrived at where I would be able to say something definite. I have, at times, within my own circle of acquaintances, made certain statements which, with suf-

ficient humility, I retracted later on, so I am leery about making any positive statements. I suppose likely that if most of us had known, in our endeavors through life, how much money, toil, and energy it takes to get into it, we would have thought twice before we went in. In this connection I am reminded of a story I once heard told by President Chalmers—perhaps some of you remember him, he was renowned throughout the mining world. A friend of his up in Minnesota wrote to him about a saw mill, told him how many feet of lumber were to be cut, etc., and wanted to know the price of it. Well, they figured it out, and sent him a letter, giving him the price, about $30,000, or something like that. They didn't hear anything more about it. One day, long after that, Mr. Chalmers met this gentleman on the street, and he said, "Did you get our tender on that?" "Yes," he said, "but I haven't had time to answer it. I have been busy trying to figure out, what, if I had $30,000, I would want of a saw mill."

So it is, if one could see ahead, know all the effort, time, misery, and disappointment, and also the pleasurable experiences one gets, he would wonder what in the dickens he struck oil shale for. But I do not want to be a pessimist, at all. I have repeatedly said, "Wait until I do something. When I do something, I shall be willing to tell you. I can tell you exactly what I have done; I have made mistakes—lots of them. I may be making one now, I don't know, but anyhow I am in it, and the thing is that I will make a spoon or spoil a horn, and sometimes I think I am going to make a spoon. In fact, that is my present impression. I haven't made it, but when I do I haven't got any secret process.

I don't know that there is anything absolutely new developing. I have been trying pretty nearly everything I could think of. I want to say to you now that if I were to tell you, or could tell you, what I have deemed successful, and what I have deemed failures, I should have to emphatically state that it belongs entirely to our deposit, and our peculiar material, because as I have examined other materials—other shales—I have found they are very different. Now, if I were to say my way was the way to treat oil shales, it would be wrong. I know something about this peculiar material, but I know very little about the oil shales of the world, except as I read in books and the few samples that I get.

I have been a silver and gold miner most of my life, and can determine the value of silver ore by looking at it, but I give it up with this shale. I don't know when I have a rich piece or when I have a poor piece, by the looks of it. This is a confession of ignorance. I don't know the rich from the poor. At one time I had the idea that color had something to do with it, and that it should be a dark chocolate color—the darker the better. Then I ran into something that looked very fine, and it yielded not much over 4 per cent. of oil. I want to say this: I am with you heart and soul. Sixty years ago they used to bring Scotch shale over

here. In Brooklyn, New York, the first oil refineries in the United States were founded. Now we bore a hole in the ground and it seems queer that we would ever bother to get oil out of rocks when we bore a hole in the ground and the oil runs out. I bored some holes once, but I didn't happen to notice any oil. (Laughter.)

I am not worried about the by-products. I spent about fifteen years on those, gazing with enraptured eyes upon beautiful products with all kinds of colors and odors. I waked up all at once to the thought, "What in the world is the use of worrying about these by-products; the basic thing is the crude oil, and it has to be produced so it will meet the market ideas of the public. If you can't get it at a price that the people can pay for it, don't waste any time on a thing that may be of some other use. The thing we have got to do—somebody has to do it—is to find a way to make the crude oil commercially valuable; to make it so that it is reasonably possible to sell it to our fellow men and then sell them some more of it afterwards. What we have got to concentrate on is, in my opinion, what I am trying to do now. If you have a location where you are near a market, and near transportation, then the thing to concentrate upon is to first make your crude oil and make it cheap, so that you can hope to sell it for as much as it costs you, anyhow. Now, I don't know what has been done by other people. I have read in the papers occasionally of fairy tales about what we were doing, and I have read about what other people were doing, and then I reflected that if it was as true about the other people as what the papers said about us, we couldn't believe any of it, because they seem to be inspired with getting things rather twisted. I notice the newspapers said that a gentleman high in authority at Washington had reported on our region, that on an average, the shale would run forty-two barrels to the ton. I had a number of letters about that, after it was published, and people wanted to know if it was so. I said no; we hadn't anything like that. Forty-two barrels, you realize, would bring in a lot of money. We never had anything like that. I mean to say that misinformation is not uncommon; it is a misfortune. Now, I am not saying to you, do this, and do that, because I don't know what you should do, and I actually don't know how to advise you, except I would say to you, study the situation and study ways to produce your product cheaply. I could, perhaps, bore you with certain things, and warn you of certain things, but you know as much about that as I do. It seems to me that if I say anything at all it won't be anything that will be constructive. I might, if I knew what somebody else was doing, tell them what I thought about it—whether I thought it was any good, or not—but I don't.

Another thing, I have wondered why we worry so much about getting unsaturated type of lubricant. What do we gain? Isn't it possible to still have value there, equally as good, and I don't know but better. In speaking of lubricants, I don't know but what the

unsaturated lubricants are better than the saturated. They might be. I suppose in the early days of the oil industry everything was bent towards lubricants. They had to take out the gums and the impurities that tended to clog, and they found that by refining it in that way, they could take out those gums and so purify it. Then we went along, kept up the work, improved the appearance, we got the color lighter, and so we were much esteemed because people then got into the habit of noticing an oil as having a certain color, and considered the clearer color better oil. I am taking up your time, and I am not imparting much because I haven't got much. I would like to impart a lot. As I told the Doctor, I have expectations, hopes, beliefs, and anticipations, but those are things that we, who believe in the industry, enjoy. I thank you. (Applause.)

CHAIRMAN ALDERSON: I think, Gentlemen, that if this gathering accomplished nothing more than to get Mr. Catlin on his feet, talking, it is a pronounced success.

MR. WALTERS: I came here to listen; being from the west, I should like to answer the Professor from Kentucky on just a few little things to show the reason why the oil shale industry is more opened up in the west. It is on account of the bigness. I don't know how they show up in Kentucky. Eventually, they may make more money in Kentucky than anywhere else. About forty years ago when I prospected through that country for copper, and silver, and gold, we ran across the shale and we burned some of it, but had no idea of trying to get any oil out of it. There is another thing that hasn't been mentioned here that we have, in the west, and that is saturated oil sands. I didn't hear anything mentioned about it but I will say this, that we have the largest known saturated oil sand croppings on the western edge of Colorado, extending into Utah. We are now working on that. My son, who is a graduate of the Colorado School of Mines, and myself, have been making a number of tests on the oil sands and we have met with fairly good success, as far as getting the oil out of sands. I don't know whether that belongs here, but it is the matter of getting oil we are after. I thought I would just mention that, otherwise, I haven't much to say. I am very glad to be here to hear this discussion.

CHAIRMAN ALDERSON: I wish, Gentlemen, that if you have any contributions to make, no matter how unimportant, you would make them for the benefit of those who are not here, but will read about what has gone on. Be kind enough, please, without being asked, to make any contribution you can.

MR. FRANK W. ARMSTRONG: I am intensely interested in the production of oil from shale, and oil sands, and so much so that we built a process, having it in operation here in Chicago. We give you a cordial invitation to visit it. We spent our own money to work the thing out, and to demonstrate that we were right. I can say we are accomplishing results that are a great deal beyond what has heretofore been accomplished. I was much inter-

ested in some of the statements made in regard to Kentucky shale. The gentleman who had the idea down there in Kentucky, of development, of mining the oil shales and the oil sands, went into what is known as an abandoned field. In fact, it is the first ground that was drilled in Kentucky, thirty years ago. That was at the town of Irving. They struck oil sand there and that was known as the Irving sand. We went through 110 feet of solid shale. It differs from the Colorado shales and western shales. It is a much more ancient formation. Instead of being in strata, with a rich streak and then a thin streak, it seems to be homogeneous all the way through. We made a test, and got fifty gallons of oil a ton. The best result we had been able to obtain before had been from eighteen to twenty gallons. Then, the sand that is below the shale, after the oil seeps out of it, we put through our retort, and recovered eighty gallons of that. That is called a sand; it is not a sand, it is a fossil formation, and after the oil is out of it, according to the State Chemist of Kentucky, at Lexington, it is valuable as a land fertilizer. It has been stated there are a few things necessary in order to have success in this enterprise. One, of course, is the proper kind of shale. The most important of all is the kind of retort, one that is a commercial possibility, one that will produce the right kind of oil and at the proper expense, and I think we have those problems all solved. I thank you for your attention. (Applause.)

DR. JOSEPH BROWN: I should like to ask Dr. Alderson what official recognition Washington has given the shale proposition.

CHAIRMAN ALDERSON: I suggest that somebody else answer that question. (Laughter.)

MR. SKINNER: I understand that the Bureau of Mines is working on oil shale, and shale oil. I presume the Bureau of Mines regards it as the most important problem it can attack at the present time. I was talking last night to the representative (I don't see him here) and I asked him if it would be a correct statement that the Bureau felt that way about it, and he assured me that was the case—the biggest industrial possibility on the horizon.

MR. ARMSTRONG: Most of you gentlemen noticed, some few months ago, an article appearing in the press throughout the country, from the Associated Press, Washington, stating that the oil shale industry would not be established for fifteen or twenty years and that it was a matter only for big capital to undertake. It was one of the most misleading things I ever saw published. Josh Billings said one time that it was a great deal better not to know so much than to know so many things that weren't so. It seemed to me that article was propaganda of some sort, and ought to be looked into.

MR. G. L. ADAMS: It seems to me in our discussion so far you have overlooked one of the most important points and that is how does the oil content as shown by the diamond drill check up

with the same bed at the outcrop, and, if that question is in order, I would like to ask if there is any information on that line available.

CHAIRMAN ALDERSON: I don't believe we have facts enough on either side to warrant any scientific comparison now. The result of the sampling at or near the surface of these outcrops is known, and has been done, but, at the present time, we haven't access to the results of the diamond drilling. There is one phase of this that we haven't heard from this afternoon, but I think our records would not be complete unless we had a few words on it—that is the scientific research end. Such work is being done at the Mellon Institute at Pittsburgh, and inasmuch as they don't advertise as much as we do, from Kentucky and Colorado, not so much is known. I think it would be wise to have a few words from the representative of the Mellon Institute, Mr. Jones.

Mr. C. L. JONES: I am afraid what I have to say will be sort of an echo from Mr. Catlin, because we have spent money in shipping shale from Kentucky and also some from the western fields, played with it in the laboratory, and have done a great deal of work. We have discovered a whole lot of mistakes we have made, but don't say much. It is not because we are inclined to be secretive about it, that we are afraid to give it away, but because, as Mr. Catlin said, we don't feel sure of ourselves on a great many points. Our work on oil shale is in line with the reasons displayed by two New York darkies. They were looking at a balloon, and the first one said to the second, "Ephram, what am the cause of that balloon staying up in the air that way?" The second says, "Why, you shows plain ignorance, nigger, that am caused by different causes, sometimes by one cause and sometimes by another cause." That is the way we are still forced to reason some things. I can say in a general way that what little work we have been able to do in the short time we have been on it, has been mostly spent on shale oils, because it is rather hard to understand why much effort should be spent in getting oil before you know what is going to be done with it. Inasmuch as we have a lot of mysteries that are yet unsolved, I am afraid I will have to follow Mr. Catlin, and say I shall be glad to answer any questions I can.

MR. W. H. KNOWLTON: I only wish to occupy your time just about two minutes. This question of the Government's position as to oil shale might be answered possibly by a little prophecy.

It happened in a small town where there was a fort, by the name of Fort Dearborn. That occurred 119 years ago. The prophecy was, "Abandon Fort Dearborn; the country west of there will never be settled." Fort Dearborn stood where Chicago now stands —the third city on the face of the earth, commercially and every other way. Now, as to oil shale, Colorado, Utah, Wyoming have oil enough in the shales there to produce as much oil as all the wells of the United States, eight times over, have produced. Two

counties in Colorado alone are estimated to produce as much oil as we now use, for eight hundred years. Now, I hope that the Government predictions of that fifteen years will fall as far short of the mark as the prediction of abandoning Fort Dearborn, Chicago. (Applause.)

CHAIRMAN ALDERSON: Just to show that there is no ill feeling between Kentucky and Colorado, I am going to ask a gentleman from the east, who can probably speak for Kentucky and other eastern states. I will ask him to say just a few words so that the records of this gathering will be complete. I refer to Mr. J. A. Reeves.

MR. REEVES: I come from Indiana, and Indiana oil shales are similar to those of Kentucky; in fact, it is a continuation of the Kentucky formation that we have. There are 500 square miles in Indiana, the average thickness of which is fifty feet. The total thickness and formation is 100 feet and is homogeneous throughout. The shale is lean in comparison with the western shales; however, it can be mined far easier than western shales. We can mine it on a large scale. At the present time I am assaying it, and we hope to publish the information soon, for the benefit of those interested in the oil shales of Indiana. The publication will come out in due time. (Applause.)

CHAIRMAN ALDERSON: You have all heard of the many difficulties we have to face, but I wish to call your attention to one that we shall not have to face. When I was abroad, looking after this matter in England and Scotland, I found that they had splendid deposits of oil shale in the Devonshire region, on the English Channel. There was another in Norfolk county, but both these deposits were so heavily impregnated with sulphur that they were economically useless. The removal of this sulphur is the great industrial chemical question before the English scientist today. If they can get rid of that sulphur, which runs from 5 to 7 per cent. (the government requirement is that it shall not exceed 3 per cent., and they don't want more than two), they will enter upon a new industrial era in England, quite as important as when she entered upon an industrial career with the opening of her first coal mine. This is the great problem before Great Britain today. It is not one of our problems, but it is their most serious problem.

Have you, Gentlemen, any further contributions to make?

MR. HARDAN: I want to ask you if it is not a fact that the most desirable oil shale lands have already been taken up by the larger oil companies, and that they are now conducting experiments on their own account?

CHAIRMAN ALDERSON: My observation is that all the oil shale lands in the western states, close to transportation, having water and timber, are in private hands, and the holders of the land are having considerable trouble as to what is, and what is not, acceptable assessment work under the law. Furthermore, some of

the large companies have come into the field and have acquired large holdings; for example, the Ventura Oil Company has acquired about ten thousand acres in the Debeque field. There are others that I believe are in the field but I have not seen enough of their operations to make a public statement. I am confident, however, that there are a number of oil companies who have recognied that their supply of oil from wells is going to be exhausted, and they are looking to oil shale as a future source of supply.

MR. BARNWELL: Will this close up the oil shale conference?

CHAIRMAN ALDERSON: Presumably.

MR. BARNWELL: Why wouldn't it be advisable to have a continuation of the conference?

CHAIRMAN ALDERSON: Just as the gentlemen desire.

MR. BARNWELL: So many things ought to be taken up and this is the time to do it when we are all here together.

I make a motion that when this session adjourns we adjourn to meet at 2:30 tomorrow afternoon.

The motion was seconded and carried.

MR. CATLIN: Before we adjourn I should like to ask if there are any shale oil plants in operation in this country.

I understand that the Wallace Retort, erected in New Brunswick has been successful.

MR. BARNWELL: I was informed that it never has run. My informant didn't say why.

MR. CATLIN: What I am after is if not, why not. I simply ask for information because I don't know.

MR. ARMSTRONG: I know it to be a fact that the Wallace plant has been run successfully. It is of the intermittent type, as all of the Wallaces have been so far, and at present it is closed. The Imperial Oil, Ltd., is interested, and I understand from reliable information that they have appropriated six millions for the development of New Brunswick shale.

CHAIRMAN ALDERSON: Before we adjourn, I should like to call your attention to one or two points. A large amount of our oil shale deposits, outside of the United States, is under control of Great Britain.

If any of you gentlemen, interested as you are in oil shale, wish to send samples of your deposits to determine oil to be produced, the Colorado School of Mines will be glad to do the work for you, free of charge. (Applause.)

If, for any reason, you want shale from the west for experimental purposes, the school will be glad to supply you with what you desire.

I happen to have here some of our publications that you are at liberty to take, if you so desire, and should like to call your attention to this bottle of shale oil that has come all the way from

Esthonia, which is a curious thing in itself, and has had a long, long passage.

I would also call your attention to this bit of shale from New South Wales. I brought it because it is similar to the variety first worked on in Scotland—torbanite—and yields 140 gallons to the ton.

I am asked to announce the meeting at 8 o'clock this evening, at the Coliseum, and ask everybody to be present.

The meeting adjourned at 5:30 o'clock to meet Wednesday at 2:30 p. m.

SECOND SESSION

WEDNESDAY AFTERNOON, OCTOBER 19, 1921

The second session was called to order at 2:55 p. m., Chairman Victor C. Alderson presiding.

CHAIRMAN ALDERSON: It seems as tho there should be consideration of a number of important questions that are in the minds of all of us. With the aid of friends I have prepared a few—not a formal program, but an effort to get information on several of the live questions that are floating around, which everybody wants to have answered, and yet few can answer completely. One of these questions is: What financial preparation is needed for entering, and carrying on successfully, an oil shale enterprise. What financing needs to be done? What preliminary work should be done, and what should be the scope of it? I meet hardly anybody who doesn't have that question in mind, and possibly uppermost in mind. I shall be very glad to receive from any of you, any suggestions as to what should be the answer to the question. Make your suggestions. For the benefit of those who were not here yesterday, I will say that our proceedings are being taken down in stenotype, and will be printed and distributed to you as quickly as they can be put thru the printers' hands. If those who were not here yesterday will be kind enough to leave their addresses before they go, I will see that they get copies. The first question for your consideration is "What should be the financial preparation and preliminary steps for entering the oil shale work today, or in the near future?"

MR. BARNWELL: Do you mean as a whole?

CHAIRMAN ALDERSON: I mean for individual companies.

MR. SKINNER: To start the discussion, one of the points I endeavored to make in the paper I read yesterday was that suitable financing for research was one of the items necessary to make a going concern. It takes five items to have a successful business, and they are (1) Brains; (2) Labor; (3) Capital; (4) Raw Material; (5) Market. I do not think we need to worry about the raw material either in Colorado or Kentucky as far as the United States is concerned, or the market or labor as far as either location is concerned. We are therefore narrowed down to two items: brains, to develop the project, and the necessary financing that must go hand in hand with the brains. Of course, I am using the word "brains" in the ordinary popular application of the word, which means an organization with executive capacity, with research and chemical laboratories, with engineering skill, and that intangible something known as ability to look into the future. Now, as to the financing. To attempt to answer the question the Doctor

has asked means that we should look back into other work that has been done in the past in similar circumstances. Today we have many notable organizations, each of which maintains what may be called a research department, a development department or a division going by some other name equally applicable. The Allied Chemical Company of today is composed of four companies: The General Chemical; The Semet-Solvay; The Barrett; and the National Aniline. Each had highly developed research departments before joining the combination. The Barrett people, for instance, had as many as a hundred men in one laboratory. The General Chemical had a research department whose executive heads alone practically occupy one complete floor at 25 Broad Street, New York. The head of that department is a director of the company. The Grasselli Chemical Company maintains such an organization; the Du Ponts probably have as large a department as any concern in the United States. The Anaconda Copper Mining Company has a chemical research laboratory, in which, on my last visit, there were at least thirty-five or forty men working with other experts in physics and the engineering that must be considered in development work.

I think that this gathering will have failed in accomplishing anything if we do not realize that, to attack a resource of the size and magnitude of our oil shales, we must have a development organization that is worth while, backed by a crowd that can do the necessary financing. It is my thought that, if we can impress upon those who are attending these meetings that this view is necessary, we may hope for some crowd which will have the vision to develop an oil shale process. I have only a rough way of estimating what the various development departments of going concerns spend per year, but I estimate the Du Ponts spend between a half and a million dollars a year; the four companies in the Allied Chemical at least an equal amount; and the Anaconda Company is reported to have spent a million dollars on industrializing the production of zinc from their own ores—one item out of several. I happen to have had the pleasure of entertaining three groups from Australia who were interested in electrolytic zinc at the same time the Anaconda Company was doing this development work, and who advised me of spending several years' time using high priced men with the consequent expenditure of large sums of money. Now the zinc deposits of the Anaconda Company have been known for several decades, and were only worked eventually by deciding to attack that problem specifically and to stay with it until the job was finished. The same program is necessary in developing oil shale resources.

To give you some idea of the amount of money that will probably be necessary and indicate that it is no "pikers" game, I made a proposal last year contemplating using $150,000 a year for three years for process development and was promised several millions

to put into a plant later. I didn't tell the crowd that there was any perfected scheme in existence, although I had done the toy plant work that I thought was necessary. As far as individual effort was concerned, I felt that I was at the end of my rope and I didn't feel called upon to spend more than $20,000 or $25,000 of my own money. I do not believe in announcing a development merely as a result of having an idea; and of making a few sketches. Often I find that one may think he has a fine furnace. I have built all kinds of furnaces. I have put drawings into the drafting room with the result that the draftsmen will pick out all sorts of flaws as soon as measurements and other factors involved have to be matched up one with the other. Means of reaching the various working parts or accessibility and many other matters enter into the professional designing or arrangements that work, and the idea one has imagined may fail to provide suitably for ease of operation.

To answer Dr. Alderson's question, therefore, I should say that the development of an oil shale process cannot be done without the gathering together of an expensive crew of men who have had experience previously in doing work in other lines similar to that which will be necessary in the operating of an oil shale process, and who should have, as nearly as I can estimate, $500,000 for original laboratory work, for a toy plant, and then for a pilot plant, before one is ready to turn the investor's attention to spending a large amount of money in a working plant. The first year the Anaconda ran its big electrolytic zinc plant, which was built to produce 150 tons metallic zinc per day, it was practically gutted, even though expensive preliminary work was done. If one of the most experienced and competent organizations backed by suitable capital finds it advisable, as do all the others, to change a working plant after exhaustive preliminary work on a less complex problem than the oil shale treatment one is, we should certainly not mislead anyone by stating that the retorting is solved by some small piece of apparatus which has been conceived by someone who has a few hazy notions.

MR. A. C. MC RAE: One would think that no large sums of money were now being spent in experimental work. I am able to say that about four years ago or more, I heard of a process of coal carbonization, in St. Louis. Now, mark you, I am not interested; I am not here to speak about this process, I have nothing to sell, I mean; but I want to tell you my experience in the carbonization of shale. I had heard that coal carbonized very rapidly under low temperature. So I tried the same idea on shale, put thru a small retort, and got the oil content out of that shale in about seventy-five minutes. I am an optimist, of course. I got Mr. Wallace to build a larger retort, which would treat about 150 to 165 pounds of shale. That didn't cost very much money—about $2,000 or $3,000. I then asked who was the great authority on shale in this country, and was told David T. Day. So I employed Mr. Day to come and examine

the Wallace process. He did, and said it would work. On the strength of this, I interested my directors to make a contract, and put up eighteen retorts. We started construction work; of course I admit now that we started at the wrong end of the line. We got to the end of our string. It cost more money than we figured on. We figured on $150,000 and found it cost us double that. Then we had to get more capital and we got a gentleman from Dayton, Ohio, who told me he would put in all the money necessary. First, he wanted to know where our title was. We had none. Ultimately, about two years ago, arrangements were made for money to complete the plant. We treat about 300 tons of shale per day. That is what I call a fair commercial sized plant, and a small one at that. Now, this gentleman and his lawyer went to Washington (during the former administration) and was told that every impediment would be put in the way of granting a title to the land.

In Scotland their mania is the recovery of ammonia as a main product, and not a by-product. Now, about that time, an option on an oil shale deposit of New Brunswick had been taken. Diamond drill work had been done a year or two before that, and they were then closing for a Scotch plant. A year ago last July, the D'Arcy Exploration Company asked for plans and specifications for a commercial sized plant. Geo. W. Wallace of East St. Louis had plans prepared and a bid was put in by the Gas Machinery Company, of Cleveland. That plant was built last winter; the retort is a small one. I mean, it is only an 8 foot 8 inch vertical retort, about thirty-four by thirty-two inches inside diameter. That has been in continuous operation since April 27, 1921. That is an intermittent process. They have checked the results and, from that retort, have recovered 20 per cent more oil than was recovered in Scotland by the Pumpherston process on this same shale. They got sixteen recoveries a day from 1400 pounds production. In the refining of the shale oil, mark you, all the tests that were made there have been checked in Scotland. They have sent over five men from Scotland, and their best man about six months ago. He spent about two months on the ground, watching the process, seeing the refined process, and they have now ordered a new full sized plant. In the Wallace process, it takes the same time to treat a thirty gallon shale that it does a hundred gallon shale. The shales in New Brunswick average around thirty gallons. We shipped shale from Utah, six weeks ago, to a plant Wallace built for the American Gas Association, at Petersburg, Virginia, for carbonizing coal. The Anglo-Persian Oil Company has spent about a million dollars in experimental work. They are trying these things out to a finish. We shall, by next July, have information as to whether this process, acting under continuous plan, will work. There is one thing in its favor; that is, the cost of a Wallace plant is about one-third of the cost of a Scotch plant of the same capacity.

CHAIRMAN ALDERSON: Is the plant you referred to as hav-

ing had difficulty with its title the Ute Oil Company, twenty miles north of Utah? May I also call the attention of the gentleman to this, that in connection with what Mr. Mc Rae has said, the work of the D'Arcy Exploration Company and the Anglo-Persian in New Brunswick is matched by the work of the Dutch Schell people in South Africa?

MR. MC RAE: Yes. The Anglo-Persian has many subsidiary companies. The company in New Brunswick is a subsidiary of this company.

MR. BARNWELL: Mr. Skinner mentions the fact that money has been appropriated for experimentations, but we must realize, of course, that those are growing, paying organizations. They didn't have that to start on in the first place, did they? I don't believe you will be able to get a collective appropriation from shale interests to start anything of the kind. Mr. McRae spoke of the foreign companies. They realize the importance of the value of shales. The only work done in this country to amount to anything was done individually by Mr. Catlin, who spoke yesterday. I know, at present, of a recently incorporated company in Pittsburgh that is figuring on the same program as has been mentioned. They apparently have done their experimental work. The toy plant is in operation, and their pilot plant is in. The pattern is at the Buffalo Forge Company, Buffalo, N. Y. That completed unit is called the Portman process. A complete unit will be installed within the next forty days on some shale, somewhere east of the Mississippi river. That is about as close as we are going to come, I am afraid, to any experimental work. I only wish that the money that each of us has spent individually, could be spent in one single line of development. I attended the oil men's conference last September and there was quite a considerable interest in shale. I later had a chance to visit the previous meeting of the Mining Congress. I found that not one shale man had a single solitary good thing to say for another one. (Laughter.) That sounds funny—ludicrous—but it is a fact. I could stand here and mention a half dozen men's names (I am not going to do it) who really have done sincere work, but you would all say they didn't have any idea of what they were doing. Now, what we have got to face is not a theory, but a set of conditions, and knowing those conditions, what are we going to do? It is entirely up to this association, in my opinion.

CHAIRMAN ALDERSON: We should like to hear from other gentlemen on this subject.

MR. LOWDEN: It seems to me that the feeling which Mr. Barnwell mentions as existing between oil shale men should not extend to the subject we have right now. The competition between them, in the promotion end of their game, is what has caused this. It is not animosity; but there is rivalry, which rivalry has stood in the way of their exchanging information as to operation of the various properties. I think that if the committees which we have

appointed (and we have separate committees on Promotion and Development) did nothing else than to actually segregate the promotion end from the technical handling of the shale material, that would be the first step towards bringing about a feeling of co-operation along the technical side entirely independent of what they might be doing towards the promotion of their various enterprises. I think that step is very important. Now, many of these concerns we have heard mentioned have spent enough money, which, if taken together, would have gone a very long way towards solving the problem, to the extent of possibly having one large, successful plant. These experimental plants are called successful; they are operating, but they are not really commercial; they are not marketing the material.

Mr. John Fell, of Australia, told me that they then had (this was about a year ago) a capacity of about 200 tons per day and had spent seven and a half million dollars. They were then erecting a much larger retort, which I understand is now in operation, and handles 250 tons per day. I haven't any doubt but that it cost a mere fraction of what the first successful 250-ton plant cost, so that co-operation among the various shale men, in technical matters, should be indulged in perfectly free from all other considerations. Now, this industry is new; it is in great need of data on every detail of the operation. Many who are in the work have no doubt felt, "Oh well, we are not doing enough work now to keep any data, and the data wouldn't be valuable to anybody else." I want to impress on such, here, that you never can tell when data are going to be valuable to you. Keep it. Keep a record of every experiment—every undertaking—have a complete record of it; whether you want it or not, makes no difference. Some day you may want it and in that way a lot of data can be gathered which can be tabulated and co-ordinated, and will be of great value to the industry later on, and, whether it is turned in to headquarters of this section, or not, it should be kept so it can be turned in and made available for all members, and others. From what I hear of the possibilities of oil shale, its marketing possibilities, etc. (and I may say that I am not interested in oil shale one way or the other, except that I see great possibilities for it, as an industry in Colorado) there is no possible doubt but that the market can consume every bit of oil which could be made from shale, without treading on the petroleum producers toes, at all. If we could have all the money we need to go ahead and erect plants, go ahead and produce, we couldn't get into production fast enough to supply the demand.

MR. WOOTON: Mr. Barnwell brought up a point that I was arguing in Doctor Alderson's rooms yesterday, and I am just awfully glad he did it. You know, when I started to school, and the teacher started to tell me how to spell and write the word cat, she wrote it on the board and had me trace it a long time. If, just at the time I learned how to spell and write the word, she had turned to me

and said, "it can't be done that way," I wouldn't have gotten very far.

Back in the Spring of 1919, I came into the study of shale. I am speaking to you just as a business man. I do not know anything about engineering, or chemistry, but I have studied shale. My first volume was an elaborate affair, produced by the United States Geological Survey. I had a lot of fun; I studied and studied, and became very much interested. I did my best to get hold of every piece of literature produced on shale. My enthusiasm took me to Colorado (Mr. Barnwell thinks I should have stopped at Kentucky, but I went on to Colorado) and, while out there, had a pleasant chat with Doctor Alderson at his office in Golden. I spent some money out here too, and two or three of my friends put in some money; we were enthusiastic. I returned, and continued to study shale—drank it, ate it, slept it; and then I attended the American Mining Congress at Denver, just for nothing but to hear the chat, and here I am again. Now, back in 1919 and 1920, taking these volumes that were presented to me as being authentic—why shouldn't they be—United States Geological Survey—it was my pleasure to tell all my friends about it. My business takes me from the Mississippi River to the Atlantic Coast. I spend an evening in a man's home in New York and fill him so full of shale that he is something like the nigger who got into a fight. The fight resulted in a shot being fired. As he, in a panic started to run, he saw a rabbit ahead in the road, and said, "Get out of the way there, and let somebody run who can run." That is the way I would leave them. Then, I would return later on and probably present them with some circular of some kind, signed by some big fellow. My friend would have read some government article in some newspaper somewhere, just knocking my arguments all to smithers. Now, that is just exactly where the shale business stands today, I can't understand for the life of me, why they don't tell a story and stick to it. I am not speaking of technicalities but generalities. I can't understand for the life of me why these big fellows don't make their statements and then stick to them.

Talk about capital: Say, gentlemen, if the government fellows who started this thing way back in 1916 and 1917, had stuck by their stories, there would be more capital out of the eastern states than we could use for the development of the shale industry, but, as I say, just as you get somebody interested, and somebody thinks about going out there and putting some money in, along comes one of these big fellows that they look to for the proper information and just put the skids under him. I think that is what we are up against, and I think Doctor Alderson will agree with me when I say that, as just a business man, I have spent as much time in the study of this thing as anybody. I want to congratulate the conference on the appointment of these committees yesterday. One com-

mittee particularly, I am thinking of is this one on Promotions and Organizations.

In 1919 and 1920, I visited shale demonstrations in half a dozen places east of the Mississippi river. There are some of these fellows who are conscientious, but, as young as the industry is, it has already been contaminated by a bunch of unscrupulous stock peddlers. The campaign of this conference, I think, should be conducted in such a manner that the investing public should know that an A No. 1 proposition bears the stamp of approval of this committee, or conference, or whatever you want to call it. I believe a campaign could easily be conducted so that the investing public could say, "Has the oil shale committee of the American Mining Congress passed on this?" That could be done. This committee should act as a better business bureau, or Chamber of Commerce, or whatever you want to call it. I think it would keep the industry clean. I am convinced after my two and a half years' experience that if the ball is once set rolling, the momentum will turn the trick, but it is a pretty big ball to start and two or three men can't start it alone. There must be a crowd and the crowd must push together. The business man is occupying his place of importance in the development of the shale industry, just as does the engineer and chemist. I don't believe you can get very far without the business man, but I can't and you can't expect the investing public and business men to have the confidence they should have, if the fellows we expect big things from don't deliver the goods. Let's go.

MR. BARNWELL: I should like to ask how you could recommend the investment in any company?

MR. WOOTON: This is what I mean to say. If the big fellows of the U. S. Geological Survey and the Bureau of Mines, would stand by the general statements made back in 1916, there would be no trouble raising the capital to put the shale oil industry on its feet.

CHAIRMAN ALDERSON: Why not be specific about that?

MR. WOOTON: I believe every business man here knows what I am referring to. They are all conscientious business men or they would not be here. There are few who haven't read the volume I refer to put out by the Geological Survey which filled us full of enthusiasm and the recent Bureau of Mines publications. Thank you.

CHAIRMAN ALDERSON: The next subject which is a very closely related one, is this, and perhaps it will suggest a new line of thought to you: "To what extent have mere stock-selling companies injured the legitimate progress of oil shale development?"

MR. MC RAE: I think that question could best be answered by the investors.

CHAIRMAN ALDERSON: Well, we have some of them here. (Laughter and applause.)

MR. ROBERTS: Has the oil industry as an industry gotten

far enough along in the established methods to be bothered by the fake promoters? I am thinking of it as an industry.

CHAIRMAN ALDERSON: It is not an industry now, that is, as a commercially moving project.

MR. ROBERTS: Then if it is not a commercial moving project, the fake promoter is not going to bother you very much until you get on a sound basis.

CHAIRMAN ALDERSON: I have learned from my correspondence and what I have read, that our progress has been very seriously interfered with in the minds of the average investor, because of companies that have been formed merely for the sake of selling stock or mining shale in the pockets of the investors. I should like to have quite an expression of opinion on that subject. The amount of evil done may be minimized, but still the fact remains that if one fake concern gets busy and sells a lot of stock, and the lively newspaper reporter learns about it, he makes a story out of it, with headlines, and the ultimate sentimental effect is far greater than we might imagine.

PROF. CROUSE: I am not, strictly speaking, a business man. Perhaps I shouldn't say anything, but I know that out of a dozen or fifteen companies in Kentucky (whether they are now selling stock or not, I do not know, but they have been organized to sell stock) there are not more than three—probably three or four—that are legitimate. A thing of that sort cannot help but hurt the industry. No matter how much stock they sell, in the long run it is going to hurt them. There seems to be no possible way of keeping them out. What I should like to know is—what are you going to do about it?

MR. MC RAE: The fake promoter goes after all industry; you cannot keep him out. Ever since they started blasting rock or mining ore from the ground, there have been fake promoters. As fast as you put them in jail, others appear, but it is a compliment to the industry.

MR. WOOTON: I should like to get an expression on that suggestion of mine regarding our campaign being conducted in such a manner that the investing public will know that all legitimate deals have the stamp of approval of the oil shale conference.

MR. BARNWELL: That is exactly the question I should like to have answered. How is it possible to do this in the face of the fact that there is no successful method? How could you distinguish between an honest intention and a dishonest one before the board passed on allowing this particular company to sell stock? I should be very glad to have this happen, because I had a very personal experience with that particular thing. I know of five companies that were organized in Cincinnati by men discharged from my company for dishonesty. These were fellows we employed as stock salesmen.

CHAIRMAN ALDERSON: Any further suggestions? The

Chair might remark in passing, as he has seen this child grow, he would feel that if a committee were going to be appointed to pass upon such matters as Mr. Wooton suggests, I would rather not be on that committee for this reason, gentlemen. As many of you know, the Colorado School of Mines has been interested in this matter as we have great deposits in Colorado, and I have been interested in it because as the head of the school I felt it was a matter of state importance. Because of our activity, in my mail, again and again, I receive subtle, very subtle reasons why I, as the head of the school, should recommend a certain retort or process. I get a good deal of exercise in dodging one way and another from committing myself officially, or individually, to any such thing. A committee appointed at this time to correct those evils, I think would have an enormous task ahead of them and the moment—just the moment—they turn down something without the utmost evidence in their favor, your irresponsible stock promoter would immediately seek the courts with libel suits, just as sure as fate. Not long ago we had an instance of that kind, in Colorado, where the opinion was given in a very innocent and very authentic way. It was a wild-eyed promotion scheme, with the promoter using all the arts of a promoter, and the gentleman who was technically and scientifically correct was made the laughing stock for the time being. The promoter finally swindled a bank out of sixty thousand dollars, and was gone, but before he got away he got a lot of free advertising and airing in the papers, and made life miserable for the honest men who had told the truth about him. This is an exceedingly important matter, as I see it. I should like to have some specific authoritative way suggested in which the desired object might be reached. I should like to hear more on this subject.

MR. MC RAE: During the past hundred years, nearly all civilized governments have been trying to pass laws to protect suckers. They have absolutely failed, so the only way to get at the crooked promoter is as they did in England. About sixteen years ago they passed a law whereby a prospectus had to be signed by the directors, and they were criminally liable for all misstatements in the prospectus.

MR. HARMAN: That was a very excellent idea.

CHAIRMAN ALDERSON: May I trouble you to repeat that. Some of us are in the habit of repeating the things we want to impress.

MR. MC RAE: This question came up in Missouri some years ago, about the bucket shop laws, and incidentally the bucket shop men accused the members of the Board of Trade, Chicago, of being in the same line of business. I happened to be in the grain business at St. Louis, then, and they asked me to tell the difference between a bucket shop and a membership in the Board of Trade. I see a difference in degree only; one was petty larceny and the other was grand larceny. (Laughter.) I told them further that you cannot

pass any laws to protect suckers. It simply cannot be done. In England they passed a law holding the directors of a company responsible for every statement made in that prospectus, criminally liable, and then, another law at the same time, preventing people who were occupying government positions from allowing their names to go on any prospectus. That has been very effective over there.

MR. HOWARD: I do not think it is within the province or power of this organization to regulate or control the sale of stock. That, I think, is to be left entirely to the state governments. It seems to me that the only thing we could do would be to crystalize opinion against the promoter. If you go to the state and get too many regulations and blue sky laws, you perhaps will put on the lids too tight, so iron bound that it will be very difficult to promote even in a legitimate way. I think that if a man would come out in the mining journals in regard to the shale industry, in an article that would refer to the unscrupulous methods of the stock promoter, it would be effective. Then this article should be printed in various leading journals or newspapers in the country, or wherever shales are being promoted. I think this committee should really go on record in order to protect the industry. No doubt most of the people who are now interested in shale, do not represent the large oil interests. The large oil interests are not interested in shale as yet. They are sort of lying low. A great many people are taking up lands, and some haven't much money and naturally want to get hold of these lands and work out a process. They appeal to the public in order to get money to advance the industry. The Standard Oil, Sinclair people, etc., can go in at any time; they have money, and engineering ability. I think the unscrupulous stock promoters hurt the small men more than they hurt the big men. I heard recently of a stock man up in Twin Falls, Idaho, who took up a claim in Utah, sold $15,000 worth of stock there, mostly to school teachers. Of course we do not believe they will ever realize anything on this stock. They will have to dedicate that to experience. I do believe that we can crystalize opinion thru magazine articles, and things of that sort.

CHAIRMAN ALDERSON: The Chair is in the habit of believing that the way to do anything is to do it, consequently we will take immediate action. I will appoint you and Mr. Wooton to prepare and draw up a resolution, covering the feeling of this conference on this subject. Anything further on this subject? It is by no means exhausted. (Laughter.) Mr. Callbreath, will you kindly say something.

SECRETARY CALLBREATH: I believe it would be wise if some steps could be taken by which information as to the basic conditions upon which hopes may be founded, may be made available to those who propose to purchase stock. We all understand that any enterprise, whether it is development of oil shale, or gold mines, or copper mines, or whatever it may be, carries with it an element of hazard. There is first the hazard of finding the deposit. There is then the

hazard of finding the proper treatment for that deposit, which can commercially put it upon the market at a profit. There is, third, an equally great hazard of having the business controlled and managed by a man who only thinks he is competent when, as a matter of fact, he is not; this is one of the things the purchaser must investigate for himself. I do not believe we can do anything to prevent investments in risky enterprises; I do not think we ought to do anything when the investor understands the full extent of his risk; it is by those investments that many mining enterprises have been put on their feet, and made successful. The only point is that every investor ought to be fully acquainted with the facts, and that man who misrepresents to him, intentionally or otherwise, ought to be punished and the punishment varied according to whether or not it was an intentional act or not. If the investor has an opportunity to learn the facts, he then invests in an improper enterprise, he must abide by the consequences. When he is conveying to the investor the idea, for instance, that oil development promises a great return next year, or year after, when the present development of the industry is only fairly started, and when we don't know how long it will be before this business will be put on a commercial basis, depending on various things outside of the oil shale industry, if we can give to the investor the full facts, then the investor who puts his money into the enterprise has to carry a risk. The man who takes this risk must be willing to take a loss if the loss comes to him.

CHAIRMAN ALDERSON: Mr. Loring, will you give us an expression on this matter?

PRESIDENT LORING: As to the oil shale industry, I am very young and I don't know much about it, but it seems to me that your question might be enlarged to cover the financing of all mining operations, not only oil shale, but all other classes of public finance. It seems to me that if you take away from the public the chance to gamble you take away something they hold dear to them as many other things, that I expect you gentlemen have in mind at present, that were taken away from you during the last couple of years. (Laughter.) Seriously speaking, I have a lot to do with financing of properties. First, I go out in the field and find properties at my own expense. Then I find money to develop the properties, and I can't develop these properties without taking a chance, or my friends taking a chance. To the best of my ability I tell them of the chances they are taking; and we put our dollars together and see if we can't develop a profitable enterprise out of it. I go back in the field and use my own brains and skill to develop it. Sometimes my ideas are a failure; we lose all our money, and it gives me a headache when I think of the money I have lost within the past five years. Now, then, could you accuse me of misleading the other fellow if I have told him the chance I am taking, and the chance he is taking in putting his money beside mine? If we don't take chances we don't make anything. The man you want to get at is the man who goes out

telling that he has millions in material, carrying a certain percentage of oil. He gets elevator boys, washwomen, etc., to put their money into his scheme. He is the fellow to get at.

MR. LONGYEAR: I should like to ask what your opinion is with regard to whether the Mining Congress should establish a bureau for the purpose of passing on promotion companies, so that people may look to them as to whether it is proper for the investment of funds.

PRESIDENT LORING: Off-hand, I will say that I would not like to burden the American Mining Congress with a job of that kind. It would be a tremendous burden.

MR. LONGYEAR: The consensus of opinion here was that it would not do, but I wanted your opinion.

PRESIDENT LORING: Just think of the enormous number of promotions going on in the United States at this time. Think of having to pass judgment on all those things. Of course, if you undertook this oil shale proposition you would have to take everything. This organization embraces all of the mining in the United States. That is my private opinion as a member.

MR. HOWARD: I should like to say one word, for personally I have had considerable to do with the Bureau of Mines with regard to the bulletins they have given out with regard to shale deposits. The Bureau of Mines has sent out men to tell in a general way of the potentialities in shale deposits but these men who are sent out are not miners. The men who go out representing the Bureau of Mines are absolutely honest, and not prejudiced. Further, I am sure the Standard Oil or other large company, or any large group of interests, are not against the development of oil shale. I have been in familiar touch with all the workings of the various interests out there where these shales develop and I am sure if one of you men or a group of you men went out there and established a little plant and demonstrated that you can take out a barrel of oil, and say it cost $1.04, on a large scale, you would get all the money you wanted. Regarding the refining of the oil, it is a matter to be worked out easily. That is the one great problem before your conference, and your shale industry, to get that barrel of oil out at a reasonable cost and when you do that, gentlemen, you will get all the capital you want. It's just a matter of cost, that's all. If, today, for instance, the Doctor here, who is perhaps one of the biggest figures in the oil industry, were to establish a plant, and it should be successful, it would be but a drop in the bucket—the big interests wouldn't know it existed, except that it showed possibilities for the future. If you were to go to the Standard Oil Company and they should build a plant it would take five years before it made an impression upon the world's supply of oil. It is not a drop in the bucket; don't worry about that. This is a great proposition. Mr. Loring made a statement in regard to which I should like to make a qualifying statement. This is different from gold mining—there is a great element

of chance in that—there is no chance in shale, if the engineering is correct. You can sample the shale, know just how much oil you get from each ton, and what the cost will be per ton. The fact is that you haven't developed the mining end of it. We can market it when you get it, and the whole problem is to get it out in competition with the pumping wells. As far as finishing it up into marketable product, this is no question whatever, for we have facilities to refine it. We have facilities that can take almost any character of crude oil and convert it into the product required for the market. You don't want to feel that there is any combine against this industry. I want to say, further, that one plant or ten plants would make no impression on the market, but it would be a forerunner of what will be a great industry, which will be a blessing to the west.

CHAIRMAN ALDERSON: The last two speakers have come close to one of the questions submitted for discussion—so close that I must submit it. At what price must crude well petroleum sell, in order that crude shale oil may compete with it in the open market? You will recognize that the gentlemen have come very close to this question. I am putting the question now, pointedly, in order to get an expression of opinion. I should like to hear an expression of opinion on that point because we are all pretty practical sort of men and that is the question that comes to our minds. It has been put to me a great many times.

MR. E. C. JOHNSON: The price at which oil sells at various times has nothing to do with the cost of production, its value, or manipulation or anything else, except the people who control the supply. Some of the big companies have made prices that have simply shut up other companies. They will do it again. They have done it the last six or eight months. Everybody knows it.

MR. HOWARD: I should like to answer this statement. His statement is all hearsay, I think. The reason why oil went down in the last few months is because we consumed a great deal less oil yearly than we received, and no one could afford to store this amount. That is why oil went down. They now see a scarcity on the horizon and oil is going up. If you are to have a successfully operated commercial plant it would be necessary for oil in the field to be $3.00 and $4.00 a barrel before you could hope to operate a plant in Colorado successfully. You must figure your cost of mining, your cost of extraction, and then you must figure cost of transportation, and, in all probability, as one gentleman said, perhaps they would refine it on the spot. They would have to add freight to the finished product. I believe the time is coming when oil will go up again—I venture to say in eighteen months—to where it was. You will find out that experimenters are busy trying to work out a cheap process.

MR. MC RAE: That question of the value of shale oil has not been answered by the last speaker, properly. I took a quantity of shale oil to Mr. Howard at Salt Lake City, and asked him what he

paid for 300 or 400 barrels of this oil, daily. At that time Mid-Continent oil was selling for $1.75. After three or four days, he said for that quality of oil, carrying that high per cent of paraffin he could afford to pay $1.75. That is the information we got six months ago. The Standard Oil Company and all the big oil people are intensely interested in oil shale today, and are acquiring properties. The value of shale oil will not be uniform; there is just as big difference in the value of shale oil as there is between Pennsylvania and Mid-Continent, or Texas, or the Arkansas field. The whole question is, what can you get out of the crude oil?

MR. BARNWELL: I won't undertake to discuss any refining, or anything like that, but I am going to try to answer your question. As near as I can, at any rate, I will do this, but please understand I must necessarily speak of eastern shales, because my time has been devoted to the investigation of those shales. Most of my work has been done on Kentucky shales. Allowing normal prices, we can produce oil from shale for less than $1.00 a barrel.

CHAIRMAN ALDERSON: That is what I wanted to get at. Won't you go a little deeper into this and explain why your cost of production can be so low?

MR. BARNWELL: I will try to do that. The first thing is the extreme low cost in mining our eastern shales. This particular deposit I have in mind lies within three eights of a mile, on a good wagon road, from the L. & N. Railroad tracks. It abuts the banks of a logging river which is a never failing stream. The base of the shale deposit rises from a level identical with our plant site foundation level. That means that the shale starts within a stone's throw of where the plant will be located. Those conditions lend themselves to a very cheap production cost. Our recovery of shale is not a mining proposition; it is a quarry job. We haven't the highly stratified areas. Our shale is all comparatively low grade, but it is all alike. It is poor as regards oil content. Our shale runs 26, 27, 28 gallons, along in there. I have never seen such homogeneity in anything as I have in that. The overburden on it is possibly eight inches—we take it off with a hose. I have some photographs that will illustrate that very clearly.

PROF. CROUSE: I might say that Mr. Barnwell's deposit is not the only one in Kentucky that runs the same way. There are many others that haven't been taken up.

CHAIRMAN ALDERSON: These Kentuckians are simply irrepressible. (Laughter.)

MR. HOWARD: I would like to ask if these gentlemen have plants producing oil daily, for less than $1.00 a barrel.

MR. BARNWELL: These are estimates; we have not done it yet. I have been offered a contract by one of the largest contractors, to put the shale in my crushers for twenty-five cents a ton. That takes care of your mining cost, and that can't be duplicated anywhere in Colorado. I want to repeat, gentlemen, that this plant is now in the embryonic state; it isn't built, but is being built.

MR. E. C. JOHNSON: How fine do your crushers crush it?

MR. BARNWELL: We anticipate using a three-quarter inch mesh. That is the finest we expect to grind.

CHAIRMAN ALDERSON: I am glad that these points have been brought out, for those who have been investigating shale deposits have been obliged to look upon this matter to a large extent, from an economic standpoint, and a number of elements must come into the determination of the value of any oil shale deposit. One of them is the nearness to the market for their product; another is the nearness to a railroad; a third, a sufficient water supply; another is accessibility and perhaps there are more, but I mention those because they have been in my mind whenever I have been visiting a property. I think that over and above the question of retorting or refining comes the larger question of the economic value of the deposit which must be determined in and for itself, and such a consideration must be in the mind of everybody who tries to pass upon the development of the work in its early stages. Some properties that I have visited have had all of these essential qualifications and others have had none. Now, a shale deposit of high oil yield that has few or none of these essential qualifications is worth precious little, yet a low grade of oil shale, with a majority of these economic factors in its favor, could be made an economic success. That feature of the work has not been emphasized in the past, I think, as much as it should be, and I am very glad Mr. Barnwell has had the opportunity of bringing it to your attention.

MR. SKINNER: In addition to the remarks just made, and to clarify the atmosphere, I would like to ask Mr. Howard if the estimate he made as to cost contemplated any saving of nitrogen as ammonia.

MR. HOWARD: I am an oil refiner, and of course, we treat it strictly from the oil standpoint. Personally, I think a great many estimates are made on what we call "paper estimates." This man or that man will say to you, this crude contains 11 percent. wax, and wax is worth so much a pound. I can find a market in San Francisco, St. Louis, or somewhere else, for so many tons. He will go and present these estimates to the purchaser, and, of course, they will accept it, but he must bear in mind if a large industry had been developed on that basis, the market would be flooded with wax. Now, if you have a market for ammonium sulphate, so you can get a high price out of it, you want to measure that market and supply it to the production. I am speaking merely of treating it from an oil standpoint, not from a chemical standpoint, and am still of the opinion that if you were to build a big shale plant, and say you are turning out 100 barrels a day, the by-poducts you have been figuring on will flood the market. The demand for some of the other by-products is small. If you can get exclusive control over a certain market for ten years on wax, perhaps you can build your industry on that alone. I built an industry on a by-product of petroleum that

has lasted just so long. Another fellow found out my process. I am speaking now of a basic industry and a basic commodity.

CHAIRMAN ALDERSON: May I have the privilege of asking a question from the Chair. I am much interested in this and should like to have Mr. Howard's opinion on a question coming to me many times. "Is it wise for a man to base his work in producing oil, assuming that he can produce it, upon the broad market, we will say, of gasoline and lubricating oils, and let the rest go, or should he pay attention to the by-products at once?" Which would you say he should figure on? The substantials, for which there is a broad market, or the by-products? I have had many questions put to me about by-products. I should like to have an expression from Mr. Howard on this, as I think others would.

MR. HOWARD: I believe I would make a survey of the market demand for these by-products; I would also find out what foreign companies are supplying ammonium sulphate for; find out the market conditions and quantities consumed. I made a statement a little while ago, and I will not retract it, at all. My personal opinion is that the oil shale industry will receive attention from capitalists and will be developed gradually, if oil in the field is $3.50 or $4.00 a barrel, and remains that way; these shale oils produce certain by-products for which there is a great demand.

CHAIRMAN ALDERSON: I asked that question because when I was abroad my attention was called to the fact that certain deposits of oil shale in Germany had been worked on by German chemists, and that they had succeeded in extracting what they called ichthyol. I found, on looking this up, that it was something that apparently had been deposited with the shale, from one of the fossil animals that the geologists called Ichthyosaurus. A gentleman in England claimed he could produce ichthyol from the shales in England. On inquiry I found that this ichthyol was a skin specific that physicians want, and that a few pounds produced in Germany supplied the entire world demand, and that it was worth several hundred dollars a pound. This gentleman was planning to produce several thousand pounds in a year. According to Mr. Howard he would break the market; I think he would. I throw that idea out in case any of you gentlemen produce ichthyol.

MR. SKINNER: What prompted my question to Mr. Howard was not quite answered by him. In my paper yesterday, which some of the gentlemen here heard, I pointed out that our Colorado shales had little if anything in the way of assets other than the product of basic production turned out at present by oil refiners. The nitrogen is there in such small quantities it is not an asset, and any of the other things chemists might suggest could not be turned out in competition with other sources of raw material without, in the first place, costing too much, and in the second place, flooding the market.

CHAIRMAN ALDERSON: We now come to the next question. It seems as tho these were arranged in logical order. I will ask one

more. When will the production of well petroleum decrease to such a point that oil from shale will be an economic necessity?

MR. HOWARD: We ought to have Mr. Ralph Arnold here to answer that question. I was talking to him yesterday. In conjunction with this congress, there was yesterday a meeting here of the members of a committee on Estimates of Petroleum Production by engineers and geologists from all over the United States. They are of the opinion right now that in all probability by the middle of next year, our consumption will come up to our production, plus the imports we receive from Mexico. At present this isn't so, but in the last three or four months the decrease in output has been marked, and even the big men, the Standard Oil men and all those men, are very much surprised in the change in the trend of the petroleum business. I want to say that ninety days ago there was a great depression but now there is a wholly different atmosphere in regard to oil. Ralph Arnold, and a number of those men who are in the game, are more or less pessimistic. I told Ralph Arnold last night, "You fellows remind me of the prophets of Israel. They used to see the events coming and often thot they were going to come in a year, ten years, or a thousand years." These men see the time when oil will be rather high in the United States. I wouldn't be surprised to see oil $3.50 in the Mid-Continent field. The supply must equal the demand Just the minute your consumption equals your production you can see an immediate interest in these shale beds which have great potential possibilities, but, as I say, I can't tell whether it will be $3.50 next year, or not. You take these ten or fifteen thousand drill operators and they love the game of taking their derrick out and spotting with the idea of getting a gusher. It makes no difference whether they get oil, or not. Personally, I would rather sit down on a shale bed and get all the shale oil I could. When you establish a certain price for the production of shale oil, and you stabilize it, I wouldn't be a bit surprised if that would have a stabilizing effect on the oil from the well, and it might, to some extent, stop these wildcatters from going out, but I can't say, and no one else can say. Even the men who control the industry don't know any more about it right now than you and I. I talked to these men sixty days ago and they gave me one story, and I know they talked freely, and the story today is altogether different. They say the water comes in these wells; the Eldorado Field is diminishing; and things of that sort are great influencing factors. What they try to do is to keep the supply of oil up. There is no set of men who know what oil will be next year, but appearances now are that the price will be higher, but I do not believe, like Ralph Arnold and some of the others, that we have yet exhausted the great oil pools of America. It might be so of Oklahoma, or Wyoming, where the whole state is an open book. I doubt very much whether they will ever find another field in either of those states. You take Nebraska, Dakota, and certain parts of Texas,

where there are great big rolling fields and prairies—you can't tell what is underneath.

CHAIRMAN ALDERSON: May I make an attempt to crystallize in a few words what you have said. The gentlemen, I think, would like to carry away a crystallized thought. Are we justified now, with the knowledge that we have, in expecting that before the end of 1922, our domestic production of oil plus the imports, will just about equal our consumption?

MR. HOWARD: I don't think our consumption will equal that amount, but it will approach it. Our consumption will approach our total production plus the imports, unless other fields come in. If I were going into the shale industry, I wouldn't bother about the price of oil; I would concern myself about getting the right property, and, as you stated, have those favorable economic factors, as far as possible. I would then reduce my cost to a minimum; then you have a commercial proposition. You would have plenty of financial backing. You won't need to sell your product—just invite capital to come in and make you an offer. I wouldn't wait for the market; the market will be here before you get your plant up, as far as you are concerned. (Laughter and Applause.)

CHAIRMAN ALDERSON: We have exhausted our question box, as it were.

MR. JONES: I will not talk long. Naturally, I would hate to have any of the members carry away with them the impression that any of the larger oil companies are particularly interested in crushing the oil shale industry. That seems a foolish idea to entertain, because the oil people are in the game for the same purpose we all are, to make money. If you can show any of the large petroleum companies a source of supply whereby they can get the commodities they desire for less money than they can get them from wells they are with you. It makes no difference what you make shale oil from, pink elephants, sea water, or what, there would be no object in any pretroleum company entertaining any hostility. If, at the present time, they don't show much interest, it is because they have not been convinced that the shale oil industry is ready to deliver the goods.

CHAIRMAN ALDERSON: Has anybody else anything to say? This has been an exceedingly important conference and I think it will be increasingly important as time goes on. It is our purpose to print and distribute the account of what has been done yesterday, and today. If you will be kind enough to leave your addresses here, I will see that you get copies of the proceedings.

MR. HOLLEMS: I should like to bring out one matter before we close. It was mentioned here this afternoon that some of the eastern shale beds are very homogeneous. On the other

hand, I was told yesterday, by the gentleman who was making the analysis of a core taken out in Indiana, a 100-foot core, that he had found variations in the oil content in a length of fifty feet of over fifty per cent, so evidently the beds run far differently; some are far more homogeneous than others. I have in my hand a piece of oil shale core which I will be glad to pass around, and have the gentlemen observe. This was taken out with a diamond core drill. If anyone has had any experience analyzing cores from the west as well as the east, I shall be glad to hear from them.

PROF. CROUSE: Speaking of Indiana shales, of course, that is practically what we have. There has been no core drilling so far as I know, and no core drilling in Kentucky. I have made quite a large number of analyses of shale in different parts of the state of Kentucky, and in different elevations. There is a difference, but not a difference that will make any great effect commercially.

The meeting adjourned sine die at 5:45 p. m.

RECENT WORLD WIDE PROGRESS IN OIL SHALE DEVELOPMENT

VICTOR C. ALDERSON

Oil shale deposits are world wide in extent. Interest in them is almost universal. The deposits in Colorado, Utah, Wyoming, California, Nevada, Idaho, Montana, Kentucky, Indiana, Scotland, England and France are now well known. Information of new deposits and fresh activities are constantly coming forth; e. g., new and extensive deposits are reported from Colfax County, New Mexico, from Terrell and Val Verde counties in Texas, from the Upper Yukon valley in Alaska, from Queen Charlotte Islands and even from Palestine. In the Philippine Islands, oil shales are reported to occur in several districts, especially on the Boldoc peninsula, Tayabas Province, Luzon. The resulting oil has a paraffin base and is virtually free from sulphur.

Europe

In Italy deposits are reported in the provinces of Como, Brescia, Udine, Vicenza and Salermo. An Italian company has been formed to distill oil from the Sicilian bituminous shale. The process has been developed by Italian engineers. In 1920, 5,000 metric tons of shale were treated. An oil refinery at Rome is now planned.

The presence of oil shale deposits in Germany was well known before the war, but no serious attempts were made to develop them. The scarcity of oil during the war, however, called attention to them and effective exploration was begun, with the result that the deposits were found to be more extensive and

richer than was supposed. The main deposits are in central and southern Germany, in Saxony, at Messel near Darmstady, but particularly at Rentlingen, in Wuerttenberg. Here tests gave 250 litres of oil to the cubic meter of shale. From the Jura mountains in Bavaria, oil shale is also reported. A new German corporation "Bayrische Mineraloel Werke" has been formed, with state and national support, to develop the deposits and to erect retorting and refining plants. Before the war Germany depended upon importation for her supply of oil. The exigencies of the war taught her the importance of a domestic supply. Since the close of the war she has pursued a systematic development of her oil shale deposits in order to be free from the uncertainties of oil importation. The value of oil shale as a source of oil is clearly seen and intelligently acted upon.

In Spain oil shale deposits occur in the provinces of Castellon, Ternel, Burgos, Seville and Soria. Tests thus far have not resulted in commercial operations.

Bulgaria has no oil wells but has extensive deposits of oil shale. For this reason the production of oil from shale has received special attention from the government and three concessions have been granted for developing the deposits. These are five in number.

1. Breznik. The deposit is about 20 feet thick, yields 13 per cent of oil, and is estimated to contain thirty million tons of shale. A test of this shale in Glasgow showed, in comparison with Scotch shale, a lower percentage of kerosene, gasoline and ammonium sulphate, but a higher percentage of benzine, lubricating oil and paraffin.

2. Hadomir. These deposits are even greater than at Breznik, and are 12 miles in length. Samples have been studied in Berlin and found to yield 8 per cent of crude oil.

3. Popovtzi. This deposit is only one mile from Popovtzi, and extends for five miles along the railway. Tests made by the government showed on the average from 7 to 13 per cent of crude oil, but the best results came from shale near the village of Sirbinovo, which yielded 21 per cent of oil.

4. Kazanlik. These deposits average 30 feet in thickness.

5. Sirbinovo. These deposits are about 80 feet thick. The quantity seems to be almost unlimited. Bulgaria has great potential wealth in her oil shale deposits, which, when developed, will give her a domestic supply of oil sufficient to supply her industrial needs.

In Norway, oil shale deposits are found on the Island of Auden, in the northern part, where they are closely associated with coal deposits; also at King's bay on the island of Spitzbergen. In Sweden the chief deposits are at Kinnekulle, Nerike and Ostergötland, which have been estimated by a Royal Commission to contain five billion tons of shale. The Sweden Shale

Works Company reports that it is treating 100 tons of shale a day at its plant at Hiddings, and is obtaining an excellent fuel oil which meets competition with other kinds of fuel.

The most varied economic use made of oil shale is, curiously enough, one of the direct results of the Great European war. In 1916 the Russian Government needed fuel and turned to the oil shales of Esthonia—then a part of Russia, but now one of the new independent Baltic states—and made an exhaustive and systematic examination. It was found that these deposits formed the great potential resource of Esthonia. After the organization of the new state, the government took active steps to develop the industry, till today, in Esthonia the use of oil shale is more varied and more successful than anywhere else in the world, not excepting even Scotland.

"Kukersit," the local name for oil shale from Kukers, where it was first discovered, outcrops along the Gulf of Finland in steep cliffs. It dips slightly to the south, about one degree, so that it remains near the surface for long distances and can be mined cheaply by open cut work. The workable deposit extends from Jewe to Wesenberg, a length of 60 miles, and is six miles wide. The immediate available supply is known to be virtually a billion and a half tons. Analysis of good "kukersit" gives, on the average, the following results:

Moisture	3.86 per cent
Hydrocarbons	61.44 per cent
Coke	7.64 per cent
Ash (plus CO_2)	27.06 per cent
	100.00 per cent

From repeated tests sulphur, in the best grades, has been determined as follows:

Total sulphur	2.48 per cent
Volatile sulphur	0.43 per cent
Constant sulphur (in ash)	2.05 per cent

The shale is subject to low temperature distillation and yields usual products which are readily sold. Nowhere else is there so wide a use made of the shale itself and its products as in Esthonia. As fuel, the shale is used in a variety of ways; viz., in firing locomotives, in the Reval gas factory for the production of gas, where more than four million pounds have already been used; in the Port-Kunda cement factory, where more than two million pounds have been used; under stationary boilers, where the arrangement allows easy handling of the large amount of ash; cooking stoves, open grates and similar domestic uses; on steamers and in the burning of lime. All this use is made of the crude shale besides its use in the retort, from which are produced the oils, paraffin and coke. The chief production of shale is at the government mine at Kochtel, where the surface

improvements consist of a central power station, warehouses, depot, offices and houses for the officers and men. In 1920, 50,000 tons were produced and 500 men employed. Recently steam shovels were put into use so that the production could be largely increased. The government has opened a second mine at Port Kunda, to still further increase production. Inasmuch as "Kukersit" comprises the greatest natural resource of Esthonia and the government is bending every energy to develop it, the progress made will be watched with more than usual interest.

South America

Brazil, one of the largest countries in the world, with a stable government and an enterprising people, with a great variety and wealth of natural resources, especially excellent iron ore, is dependent upon foreign sources for fuel—coal and oil. Fortunately the deposits of oil shale are found in abundance in several places, notably along the coast from the Amazon river on the north nearly to Rio Janeiro on the south. The deposit is exposed at intervals throughout the entire distance, but is remarkably well exposed for a distance of 400 miles in the state of Alagoas, where it is known to extend for two miles back of the outcrop. Near Maceo, in Alagoas, experimental work on retorting is now being done. The late Sir Boverton Redwood reported this shale to yield 44.73 gallons of oil to the ton. With little or no coal or petroleum, Brazil naturally looks to oil shale as a valuable resource. The rapid development of the oil shale industry in Brazil, therefore, may be confidently expected.

Argentina contains numerous undeveloped oil shale deposits, of which the Rio Grande, 240 miles from Alvear, on the Western Railway, is the most important. The outcrop has been traced for twenty miles. The deposit is known to extend a mile and a half back of the outcrop, and has an average thickness of 100 feet. Like Brazil, Argentina has few deposits of fuel, so that oil shale, when developed, is likely to be her main domestic source of fuel.

South Africa

The oil shale deposits of South Africa are recognized in four well defined areas: viz., the Ermelo district of the Transvaal; the Wakkerstroom district of the Transvaal; the Utrecht district of Natal, and Impendhle county of Natal. The oil shales of the Ermelo district occur in three veins; the lowest has a thickness of 20 to 24 feet; the middle one, 19 feet, and the top one from two to three feet, with some very thin streaks. Unfortunately, the lowest and middle veins produce little oil. The top vein yields 30 gallons of oil and 64 pounds of ammonium sulphate. Only a small amount of prospecting has been done, so that the actual value of the field is not known. The thinness of the top vein should not alone bar the district from consideration, because the district is crossed by the Breyton-Ermelo railway,

and, therefore, has better transportation facilities than any of the other oil shale districts.

The main bed of the Utrecht district has a maximum thickness of 22 feet, composed of a series of beds from two and a half to five feet in thickness. These beds are not uniform throughout the district, but, in places, thin out and enlarge. A test of the shale at the City Central Laboratory, London, gave 40.6 gallons of oil and 57 pounds of ammonium sulphate to the ton; and 1.71 per cent sulphur. The distance of this deposit from a railroad is disadvantageous, but other advantages would probably justify a branch railroad from Wakkerstroom.

The oil shale deposits in Impendhle county, Natal, occur in the Molteno beds, and are best exposed on Crown lands in the Umkomas valley. E. H. Cunningham-Craig, of London, reports this shale to yield 27.10 gallons to the ton. Little development has been done, but what has been done indicates a valuable deposit worthy of further consideration.

In the Wakkerstroom district, the oil shales are found chiefly on four farms: viz., Kromhoek, No. 76; Virginia, No. 371; Goedgeronden, No. 77, and Ijzerneyu, No. 280, thirteen miles from the city of Kroomhoek. The deposit has been opened for a distance of three miles by open cuts, 200 yards apart, sufficient to show the full section of the deposit with roof and floor. Until recently control has been held, and development made, by the African Oil Corporation, Ltd. A test of the shale at the Pumpherston Works in Scotland gave 31.75 gallons of oil and 37.18 pounds of ammonium sulphate to the ton. The test also showed that the Scotch retort was suitable for treating the shale. Recently the Royal Dutch Shell interests, after a favorable report of their engineer, have taken an option for six months on the property of the African Oil Corporation. The advent of this company into the oil shale industry is an epoch making event, as it assures development and financing on a worthy scale. Also it shows the appreciation by those interested in oil production from wells, that, in the future, they must depend upon oil shale as the source of oil.

These interests are also examining the Sakalava oil shale deposits in Madagascar.

In other parts of South Africa oil shale deposits are reported; e. g., in the beds of Basultaland; in the so-called Black shale group in Southern Rhodesia, and in the Matatiele Division of Griqualand East, Cape Province. A test of this shale, made in the Government Laboratory at Cape Town, yielded 25 gallons of oil to the ton.

The absence of a domestic supply of well petroleum, the consequent importation of oil and oil products, and their high price, a large local demand, the presence of substantial deposits of oil shale, all followed by the active interest of such a colossus

of financial strength as the Royal Dutch group, combine to indicate an early development of the oil shale industry into a successful commercial basis in South Africa.

Australia

Oil shales occur at various places in Queensland on Munduran creek near Gladstone, on Casuarnia island, Redbank Plains in the Ipswich district, and on Murray's creek near Toowoomba. The deposit at Duaringa, on the Central Railway line, shows a thickness of 6 feet, and yields 30 gallons of oil to the ton. At "the Narrows" the deposit extends for sixteen miles along the outcrop and inland for a distance from one to two miles. On Curtis island the deposit occurs between Badger and Monte Cristo creeks. Shale from the Munduran company holdings gave 28 gallons of oil and 47 pounds of ammonium sulphate. The most promising deposit in Queensland is in the Port Curtis district, reported by Lionel C. Ball, Government Geologist. Two beds, 10 and 9 feet thick, respectively, yielded 38 gallons of oil and 29.6 pounds of ammonium sulphate to the ton; sulphur one per cent. A sample tested by Ronald Johnstone & Son, of London, gave 45 gallons of oil and 21.90 pounds of ammonium sulphate to the ton; sulphur 0.57 per cent. These deposits are well worth systematic development and exploitation.

The best known deposits in Australia are in New South Wales. The local name of "kerosene shales" is inaptly applied, as the deposit has the characteristics of the English "Torbanite" material, yields a very high percentage of volatile hydrocarbons (89 per cent. in pure samples), and does not split in parallel layers but has a conchoidal fracture. The discovery of oil shale in New South Wales was made as early as 1802, but was not formally noted till Count Strzelecki, in 1845, described it in his book, the "Physical Description of New South Wales." Commercial production began in 1865, with 570 tons. The total production from 1865 to 1919 was 1,840,876 tons of a value of 2,502,813 pounds sterling. At Joadja the earlier operations were conducted by the Australian Oil and Mineral Company, but a newly formed company—The Shale Petrol Oil Co., Ltd.—has taken the property. Recent developments consist of 200 feet of tunneling, two miles of new road, a retort, and a storage tank of 30,000 gallons capacity. The deposits at Newnes have been known and worked for many years, but the results of the Commonwealth Oil Corporation were disastrous, and a receiver was appointed. John Fell has revived the company, installed new retorts, and put the company on a commercial basis. The trouble seems to have been not a supply of shale, nor a method of treatment, but inability to secure labor of the proper type. These troubles are now over and success seems assured. A new mine with eight working faces has recently been opened. The

shale yields on an average 80 gallons to the ton. During the year ending June 30, 1920, the company received $81,460 as bounty on oil produced. A sample of the oil shale from New South Wales tested at the Colorado School of Mines, yielded 140 gallons of oil to the ton of 2,000 pounds.

In Tasmania oil shale, locally known as "Tasmanite," is found in the Mersey district. It occurs near the surface in beds up to 12 feet in thickness, yields 40 gallons of oil to the ton, and is estimated to contain twelve million tons of shale. A company of English and Australian capitalists has recently acquired interests near Latrobe, and is planning to erect a plant of 100,000 tons annual capacity. A sample of Tasmanite, tested at the Colorado School of Mines, gave 68 gallons of oil to the ton. Besides the deposit of Tasmanite, there is a deposit of rich kerosene shale, similar to that of New South Wales, at Preolenna.

The oil shale deposits in New Zealand have been examined and favorably reported upon by the engineering firm of Ronald Johnstone & Son of London. These deposits are in the county of Wallace, adjoining the township of Orepuki, and are owned by the New Zealand Coal and Oil Company. Prospecting by diamond drilling showed four veins of shale, each between four and five feet thick, and an available tonnage of a million tons of shale. A test on 57 tons of shale, made in Scotland at the Pumpherston Works, gave 38.41 gallons of oil and 19.12 pounds of ammonium sulphate. The fractionation of this oil gave:

Kerosene	25.92 per cent
Gas oil	3.07 per cent
Medium oil	4.05 per cent
Lubricating oil	17.55 per cent
Hard paraffin four per cent of oil melting point 119.5	19.03 per cent
Soft paraffin M. P. 86.5	1.08 per cent
	70.70
Loss in refining	29.30
	100.00 per cent

These deposits are, on the whole, of commercial importance, can be operated at a profit, and are deserving of exploitation and development.

Canada

In the province of Saskatchewan, Canada, two hundred leases on oil shale land covering an area of 130,944.81 acres have been issued. The oil shale deposits of the Pasquia hills are reported to be of commercial value both in oil and ammonium sulphate. Along the valleys of the Matagami, Moose, and Abbitibi rivers, in northern Canada, the discovery of oil shales in commercial

quantities is announced by the Canadian Government. Shale from the Abbitibi river gave 87.36 gallons of oil to the ton. Other samples yielded as much as 123.2 gallons to the ton. Samples of shale from Newport Islands, County of Gaspe, Quebec, submitted by R. E. Lenthall, were tested at the Colorado School of Mines, and yielded 22.24 and 51½ gallons of oil to the ton. Oil shale deposits on Graham Island, Queen Charlotte Islands, are reported but only preliminary prospecting has been done.

The potential value of the oil shale of Newfoundland is very great. The deposits cover an area of 750 square miles, the largest of which lies between the head of White Bay and Deer and Grand Lakes. Here the thickness ranges from 50 to 100 feet. Average shale yields 50 gallons of crude oil and 80 pounds of ammonium sulphate.

The "Stellar" oil shale deposit at Pictou, Nova Scotia, covers an area of ten square miles and contains five hundred million tons of available shale. For economic working the deposit is ideally situated, in the center of a manufacturing region, with convenient rail and water transportation, ample water supply, and a good local market. The deposit has been examined by prominent engineers and scientists like Williams, Miller & Robertson, Edinburgh; Sir Boverton Redwood; Dr. A. E. Dunstan of London; and Dr. A. E. Hunter of Edinburgh. Their reports have been exceedingly optimistic. One-third of the deposit, averaging 24 feet thick, that can be worked by open cut methods, is estimated to yield one hundred million tons of shale. One seam that averages 40 gallons of oil and 79 pounds of ammonium sulphate contains thirty million tons of shale. Beyond question this deposit is worthy of economic development.

The oil shale deposits of New Brunswick have been known since Dr. Albert Gesner, in 1851, distilled oil from the Albertite of the Albert mines at Baltimore, now Rosedale, but the discovery of flowing well petroleum in Pennsylvania snuffed out the life of this budding industry. Time and time again attention has been called, officially and privately, to the importance of developing this oil shale deposit in New Brunswick till at last the British Government itself, through the Anglo-Persian Oil Company and the D'Arcy Exploration Company, has become practically and financially interested in developing the shale and experimenting upon the retorting and refining processes. An experimental retort of the Wallace type of eight tons daily capacity has been erected with satisfactory preliminary results. During the present year a drill hole has been put down for 1,005 feet of which 940 feet was in oil shale and the bed had not been passed through. Other drillings amount to 17,000 feet. The most conservative estimate of the yield is that of Sir Boverton Redwood, 32.7 Imperial gallons. With a

virtually inexhaustible supply of oil shale, a promising process of retorting, with local interest like that of Lieut. Gov. Pugsley and Matthew Lodge behind the project, and the financial support of Great Britain, the outlook for a successful result could hardly be improved.

A comprehensive and world wide view of the situation suggests a few striking facts.

1. The supply of well petroleum cannot be depended upon to supply indefinitely the needs of industry and advancing civilization for oil and its derivatives.

2. The oil shale deposits throughout the world are virtually inexhaustible and supply a "second line of oil defense," as it were.

3. The main problems to be solved are:

a. The perfection of a retort of large capacity, foolproof in operation, and designed on correct scientific principles, that will produce the maximum amount of good oil.

b. The refining of the crude shale oil, not into a long list of chemical curiosities, but into a few standard products for which there is a steady market, and

c. The co-ordination of the various elements so that as a business project the whole will be an economic success.

4. There is a world-wide interest in oil shale—financial, economic, technical, chemical, and practical—that augurs well for its early development into an important factor in the economic advancement of the entire world.

CO-OPERATION IN DISSEMINATION OF OIL SHALE DATA

S. E. Barnwell

Our presence here this afternoon indicates our mutual interest in shale, so I won't waste any of your time in preliminaries.

A very wise old Englishman, named Huxley, once said, "The greatest tragedy of science is the destruction of a beautiful hypothesis by the appearance of an ugly fact." That is very applicable to us. We like to believe that we are getting somewhere, but the actual, concrete fact is that the progress of the oil shale industry, evident at this session of our Congress, does not compare with that of the last one, nor that of the Oil Men's Convention of last year. I believe the cause of apparent lack of progress is a lack of intelligent co-operation, rather than a lack of financial resources.

What we want to try to do today is to get some unity of action and to see if we can't organize some sort of headquarters, for the collection, and later the dissemination, of oil shale information. It may seem a broad statement to make—and it is a broad statement—but I honestly believe that the gathering here this afternoon can actually determine the continuance,

or the lack of continuance, of the industrial supremacy of this United States. We have become absolutely dependent as a nation on a continued oil supply—and where is that supply to come from if not from the shales?

There has been a terrific economic waste through the duplication of investigatory work on the part of a great many companies and individuals. There has also been a competitive spirit between shale men themselves rather than sane and profitable co-operation. We have so much outside unbelief and antagonism to overcome that surely there is neither room nor need for discord among ourselves. There can be no competition in the shale industry during the life time of anyone here, as the demand for the products we expect to produce far surpasses our ability now or in the near future to supply. So let's get together.

Just now money isn't too plentiful with any of us, so why in the name of common sense or good business should any concern now entering the eastern shale business duplicate the expenditures I have already had to make along identical lines for my company, when I will only be too glad and willing to place what new information I have been able to gather at his disposal, if I know where to locate him. I ask only one thing of any prospective seeker of information and that is that he be in business for the development of the shales and not for the exploitation of the investing public. Collectively, we have an enormous job ahead of us in developing and standardizing the method of best handling our many different grades of shales so as to get the maximum results both as to quantity and quality of products educed. We can't afford to let the theories run away with our judgment, nor can we afford to neglect any theory that appears plausible or reasonable. No one man can, and no one man should, carry the whole burden of investigation, and no one man should be expected to personally correlate the available shale data. We have here in our Mining Congress an organization created expressly for just such a contingency and while we are in a measure bridged as an industry between the mining interests on one side and the petroleum interests on the other, let us not lose heart because of that fact, but make both of these interests serve us. I do not undertake to formulate a remedy for our present lack of cohesion—that is for discussion by this body—but before I leave the subject I want to express my appreciation to the one institution which has so far done wonders with very slender resources—I refer, of course, to the work of the Colorado School of Mines at Golden, Colorado. We all remember Aesop's old story of the bundle of sticks. So let's keep our faggots together and show the world what can be done by a modern application of the motive of the immortal Three Musketeers and honestly say that we are "all for one and one for all."

SOME NOTES ON THE PRODUCTION OF OIL FROM SHALE

Lewis B. Skinner

Many articles on the eduction of oil from oil shale have been noted with considerable interest by those living in Colorado where large quantities of shale are in evidence. Little attempt will be made in this paper to touch upon the nature and distribution of the deposits except to state that these shales are certain beds of sediment which have been charged with organic remains of sea life and Colorado contains the most extensive deposits yet found. The towns of Grand Valley and Debeque are the most advantageously situated near them.

The laboratory methods ordinarily used for the distillation of the organic hydrocarbons from shales do not provide in any particular way for the production of desirable compounds, but are sufficiently useful to indicate the approximate yield of oil which one may have for refining. The yield will be reduced by the refinery losses. From the fairly large number of distillations made, it is fair to assume that the workable material will average at least 42 gallons per short ton. Since 42 gallons is the conventional amount allowed to a barrel of oil, the tonnage run in a plant may be expected to yield an equivalent number of barrels.

The liquid produced as a result of ordinary retorting is called "oil" conventionally, but it is not the same kind of material, chemically, as the oil produced from wells even though the natural material varies somewhat widely.

The deposits have been known to exist and to furnish an oily material for a long time just as we have known large low grade mineralized bodies which are not worked, but there is no oil shale industry today because of the ease and, therefore, cheapness of producing well oil from localities where nature has collected a more highly satisfactory material than man's art has been able to elicit from shale.

As long as sufficient crude oil of a desirable kind can be won by drilling the ground relatively cheaply with a resulting low price for the crude produced, there will not be a sufficient stimulus to competent technologists and financial interests to attempt to exploit a properly developed eduction scheme which comprehends the demands for a large number of salable refined products. At times the price of crude oil has advanced sufficiently to make the working of oil shale seem opportune with the result that there has been a touting of processes by those having but little experience and training in developing complex industrial procedures and with little hope, therefore, of attracting the attention of the careful investor or even the speculator. Likewise there has been a creation of some interest on the part

of substantial engineers and investors but such who appreciate the complexities are proceeding very cautiously indeed.

There is no need of belittling the efforts of any who feel that they wish to play with oil shale processes, no matter whether there is justification for doing so or not, but we should condemn those whose object seems to be to take advantage of a wave of interest in a possibility for the sole purpose of feathering their nests at the expense of the credulous.

Fortunately no great amount of money appears to have been wasted on our Rocky Mountain shales as yet, as a result of backing up the well intentioned but amateur process inventor, but there should be a determination to see that our mining wildcatting experience with the consequent reluctance to investment in legitimate mining is not duplicated, as it certainly will be provided there are not enough of those experienced in the conduct of similar matters taking it upon themselves to urge caution.

The processes advocated, which have come to my notice, fall largely into the laboratory idea of an enclosed metallic vessel surrounded by heated gases, followed by simple condensers, either water or air cooled. Since many are to be criticized because of lack of ingenuity; because of failure to recognize that destructive distillation is being carried on; because of little display of an understanding as to the necessary engineering for suitable construction and for "ease of operation" later and because of failure to design against a relatively high capital expenditure per ton treated, it is not advisable to mention any process specifically. I shall attempt only to indicate some points that must be covered before there can be a successful outcome.

Just as the prospector fills his niche in mining, so does the process touter fill his in the development of an oil shale industry. Without the prospector the mining engineer would have poor sledding and without the process advocate we can not hope to create a desirable interest in an industry which will come into existence one of these days.

The development is greatly handicapped by the fact that the ordinary aggressive type of individual who might succeed to some extent in most affairs is not able to make headway with what appears to be a demand for a simple retort and condenser. Therefore, before any serious progress can be made, capital must arrange for a corps of chemists and engineers who have had experience in plant designing, operating, and in the carrying on of laboratory research, who are the best to be found.

If this paper succeeds in making the point that no particular money should be wasted on the average process promoter and that large sums should be made available to the trained engineer, research man, and administrative type of individual, its

purpose will have been served. No novelty is claimed for this idea; it is held by several.

Such a view point was found necessary, after much worthless playing around, before some now prominent enterprises became going concerns. The crowd that came along with that viewpoint or had the necessary vision to acquire a low grade undeveloped resource and apply the required capital and costly brains, succeeded. The production of oil from shale is a "low grade proposition."

In the case of what now goes by the name of the Utah Copper Company, it was known for some time that there were enormous deposits of low cupriferous material. Several small mills utilizing one after another process promotions were tried out in the district but without success until a crowd capable of backing high-class judgment came along with the money necessary for investigatory work of a costly kind and with the acumen and promoting ability to finance on a magnificent scale.

The Anaconda Copper Mining Company of Montana is reported to have spent one million dollars on laboratory research, toy, and pilot plant development and so on, before they were able to pioneer the industrial production of electrolytic zinc. That expense would have been exceeded, had they had to build up the large, ingenious, and competent organization which was available as a result of their other large scale technological operations.

Other illustrations might be cited but, in my opinion, were these problems only solved as a result of securing those most expert, the more difficult problem of evolving an oil shale process can only come from an equally efficient arrangement.

How hopeless then to expect to develop a real industry as the result of placing, say, a hundred thousand dollars for a plant in the hands of a so-called inventor, who has at no time been accredited previously as an engineer or works chemist and who has not had to do with at least the same kind of moves required, nor has had to demonstrate executive or inventive capacity.

Reference is made repeatedly to the Scotch shale retort with the subconscious thought that it ought to be possible to adapt this apparatus to our western shales. Units consisting of vertical cast iron tubes connected respectively at their bottoms with cylinders or ovals of brickwork are used. The upper cast iron part is generally some 11 feet long by 2 feet inside diameter at the top, increasing to 2 feet 4 inches diameter at the bottom. The firebrick section is usually 20 feet long by 2 feet 4 inches inside diameter at the junction increasing to 3 feet diameter at the bottom. This arrangement provides for a shaft ca-

pacity of some 150 cubic feet to run some 4½ tons of shale per day.

The combination of the four or more tubes is surrounded by furnace walls arranged in such a manner as to cause a desirable circulation of the products-of-combustion gases which are to furnish heat to the material charged. Steam equivalent to about 100 gallons of water per ton of shale is admitted at the base of each column for the purpose of assisting at the removal of nitrogen as ammonia. Some 45 pounds of ammonia and some 20 gallons of oil no doubt may be considered an average production.

The name "kerogen" is given by the Scotch people to the organic matter in the raw shale. This is empirical, not being derived from a chemical compound, so is no more satisfactory than the expression "organic matter" but, since its use has been established, it will be continued.

While much chemical laboratory research work has been carried on in an attempt to formulate some theory as to why various hydrocarbons are found in the oil educed, there does not seem to be much information available which is illuminating.

According to the records there was the usual floundering around in the beginning of the Scotch industry but, at the time, the same factors that determine the good chemical process of today, as against the bad ones, were in evidence. When a crew of chemical works operators who had had the experience necessary to produce dividends in other lines became interested and settled on the vertical retort, somewhat similar to the one of today, as meeting the requirements, the industry was started and has since proved profitable.

Our Rocky Mountain shales do not contain much nitrogen and are, therefore, incapable of producing ammonia in sufficient quantity to create a material asset. The problem then is to develop a process that may be operated on a sufficiently large scale to create dividends out of the margin between the cost of operation and what may be sold as finished petroleum products. On the average it is almost possible for the Scotch shale to take care of the cost of operation from the sale of the ammonium sulphate derived so that, to a certain extent, they consider the oil in the nature of a by-product.

Since they have the nitrogen and we do not, it is not difficult for the technologist to understand why their way of doing things, so as to gain the largest amount of this element, is not exactly applicable to our western shales where we cannot hope for much of a commercial recovery. And it is also possible to see that where they are not particularly concerned, under the competition offered, as to the kind of motor spirit and lubricants produced or the refinery losses sustained, such might be-

come unbearable in our case, since we would have to compete with producers of excellent grades from a superior natural petroleum.

We have analogous situations in the metallurgical field. The Europeans have never been greatly concerned at the use of plenty of labor. A workmen's service is a relatively cheap part in their cost processes. In the United States, however, labor has been much higher invariably and particularly so in most places where metallurgical operations have been carried on. We, therefore, have led other nations in the evolution of practically all types of mechanical ore roasting furnaces; of ore unloading and conveying systems; of devices for gravity concentration; and of coal dust firing for large reverberatories and so on.

Necessity is the mother of invention but we have the corollary—Yankee ingenuity—and I believe that, when once there is a permeation of the idea that there must be an application of this same ingenuity to our higher-kerogen-content western shales, the problem will be solved, and, possibly, as in the case of our metallurgical devices, we even may hope to show the Scotch something about it later on.

The vertical tube is objectionable because the vapors, distilled after their primary formation, are compelled to remain for some length of time at an elevated temperature and are broken down or dissociated. The heat applied to the shell must pass to the material in the core through the poor-heat conducting, claylike residue and through the voids between the particles. Any engineer who has attempted to arrange insulation against heat loss will realize that these conditions are approaching the ideal for which he is struggling, i. e., the providing of a poor conducting solid packed loosely so as to form air cells.

To overcome the reluctance to take up heat and work at a commercial rate, it becomes necessary to apply a high temperature to the shell. Now the vapors given off from any part of the charge must fill all the void area, no matter whether a part is superheated or not, so, in passing on out of the container, they circulate in the voids around the particles near the shell at a temperature considerably above that required to educe them and as a result suffer decomposition. This condition is offset somewhat by the introduction of steam, which tends to sweep the vapors out of the apparatus before the decomposition, which takes time, can be complete. The steam itself becomes a heat removing medium and raises the demand for an increased amount of fuel. Further, it is not a good principle to have to superheat the material next the shell to send units to the core and then have the superheated shell material cooled by the vapors given off by the core material, even if there were not the attendant destruction.

This effect is further enhanced by the fact that the ratio of gas volume to liquid volume is not very great. Whereas one volume of water expands to some 1,700 volumes as steam, the average run of liquid hydrocarbons may only occupy from 100 to 200 volumes as vapor, so that, when distillation is carried on, there is not the assistance that large volumetric displacement would furnish.

Now in the various hydrocarbons called "oils" we have to do with a great variety of chemical combinations of the elements hydrogen and carbon joined together in various proportions depending upon the molecular structure. To refresh our memories, valence is the combining power an element or compound has. That of carbon is four, in that it can combine with four univalent hydrogen atoms or the equivalent. The simplest saturated combination of hydrogen and carbon is methane which constitutes a large part of natural gas. Its popular name is marsh gas.

The hydrocarbons have the property of being able to combine, as unsaturated radical, one with another until very highly complex compounds are formed. The means used to indicate the combining power graphically is called a "bond." Since carbon has four of such and hydrogen only one, the four of the carbon atom can be joined by four hydrogen atoms to form a stable compound. Assume that we have a radical of methane, CH_3 (called methyl) we have one bond unsaturated and ready to chemically unite with some other radical not itself saturated. Should the other be another radical, CH_3, the two could unite to form a compound, C_2H_6, (called ethane) which is saturated. Such combinations of radicals of hydrogen and carbon can occur to a pronounced extent and in general the atom of carbon must be considered as the dominant one. For this reason it is assumed that in the case of the radicals used for illustration one of the bonds of the carbon of one methyl (CH_3) is joined to the loose bond of the carbon of the other methyl.

This property of carbon provides for several series of hydrocarbons which are homologous. The series most commonly met are the paraffins, CnH_{2n+2}, the sub-letter "n" representing a number; the napthenes, CnH_2n, which are cyclic or closed chain compounds; the olefines, CnH_2n, which are open chain and therefore unsaturated; the acetylenes, CnH_{2n-2}; the terpenes, CnH_{2n-4}; and the benzenes or aromatics, CnH_{2n-6}.

When, in the paraffin series, we use the figure "1" for "n", we have CH_4 called methane; when we use "2" for "n", we have C_2H_6 (ethane); when we use "3" for "n", we have C_3H_8 (propane) and so on. When, in the case of the acetylenes, we use "1" for "n," we have only "C" or carbon itself when we use "2" for "n", we have C_2H_2, called acetylene; when we use "3" for "n", we have C_3H_4, called allyline, and so on.

It will be observed that the aromatic series, C_nH_{2n-6}, cannot form anything lower than C_6H_6, which is the benzol of commerce derived from coal tar and used for the production of dyes, explosives and various medicinal preparations. Members of the benzine series are not to be found in petroleum ordinarily. Benzol is isologous with hexane, C_6H_{14}, which has a boiling point of 69° C. whereas the boiling point of benzol is 80.4° C. The boiling points of the corresponding isologous members of the different series change as the proportion of hydrogen to carbon varies. Since the atomic weight of carbon is twelve and the hydrogen one, this might be expected. The less of the gaseous hydrogen to the solid carbon the higher the boiling point.

As the molecules of any one series becomes more complex, i. e., have higher numbers for "n", the boiling points increase. This might be expected in a homologous series because there are more atoms in the complex molecule than in the simple one and all molecules in the gaseous state are of the same volume.

Now since the refining of oils depends primarily upon separating the hydrocarbons of various volatilities, it might be well to touch upon what should be expected in the various fractions, and what general ideas may be made applicable in the education of oil from shale.

Paraffine hydrocarbons largely compose the light or more volatile constituents of petroleum. Up to butane, C_4H_{10}, boiling point 1° C., the paraffines are gases at ordinary temperatures and pressures. The next member of the series, pentane, (C_5H_{12}) boils at 36° C. and is, therefore, a very volatile liquid at ordinary temperature and pressure.

Since the range of boiling points determines the empirical classification into which the various products are put, the names gasolene, kerosene, fuel oil and so on have no particular significance. However, the ordinary natural run gasolene of commerce with a specified end point of say 225° C. or 437° F. would include pentane on the low end and duodecane ($C_{12}H_{26}$) whose boiling point is 214° C. on the high end. Since any distillation of a more volatile constituent tends to drag less volatile ones with it there would be some higher in the series carried over in small amounts. Redistillation may be used to reduce the too high boiling point fractions.

The next heavier or kerosene fraction runs from tridecane, $C_{13}H_{28}$, of a boiling point of 234° C., up to ostadecane, $C_{18}H_{38}$, having a boiling point of 317° C. The next hydrocarbons of the series are solids and are found only in solution in the other liquid, since it is obvious that the ordinary well can discharge only what can flow. Those fractions, therefore, providing the fuel oil, gas oil, or lubricating oil must be in some hydrocarbon series below the paraffine except for the solid paraffines in solu-

tion which in refinery practice are removed by chilling, filtering, and sweating.

When the hydrocarbons which are more complex than kerosene and, therefore, would require a temperature in excess of some 300° C. to boil them, are heated without some means to cause them to pass over, their very complexity along with the requirement for a high temperature tends to cause them to dissociate. The boiling point may be lowered by the use of a vacuum or by passing inert gases through the hot liquid so as to evaporate them.

When it is remembered that water will evaporate during the winter months at temperature far below that necessary in a steam boiler as a result of air passing over the surface, it is not surprising that steam, present in every industrial plant and inert to oil, was used in the early refinery practice to assist at the so-called distillation of the heavy fractions. It is used to a material extent today and is a very desirable aid because it itself is condensable and does not, therefore, provide the objection that a non-condensable gas would of keeping microscopic first droplets of condensed oil, existing as mist, from coagulating together into a liquid mass.

An oil refinery must meet the demands of the market. It is not enough to know that, ordinarily, the various primary separations can produce a certain class of products depending upon the analysis of the crude. Certain moves must be made today so as to provide alternates instead of taking the low price ordinarily paid for fuel oil. In the earlier days of the refinery, the more volatile fractions were not desired, so, in as far as practicable, the refiner burnt them. He still burns certain other fractions when it is cheaper to do so than to attempt to work them up, but the entrance of the automobile into our affairs created a demand for gasolene and for fine lubricating oil out of proportion to the demand for the balance of the crude so that there has been an increased tendency to balance up the refinery operations by producing cracked motor spirit and specially selected and refined lubricants. The cracking is done mostly on that material which has heretofore largely found an outlet at a low price as gas or fuel oil and some blended motor spirit now runs more in unsaturates than the refiner would have thought, a few years ago, could be sold.

If, to avoid the breaking down of the highly complex high boiling point hydrocarbons, a vacuum has been applied or evaporation by means of inert gas has been used to crack an oil, exactly the opposite procedure is indicated. While, as a generality, pressure and the absence of fixed gases is sought, other factors such as the formation of hydrogen and the inhibiting effect of carbon in quantity, along with the mechanical nuisance of build-

ing up flint coke has created limitations which up-to-date, have not been well met.

Since the paraffine hydrocarbons up to those of the heaviest end of kerosene are relatively simple compounds, there has not been any commercial success noted in attempting to use kerosene as a starting material for cracking to motor spirit.

The formation of elementary carbon and hydrogen may be accounted for in that a complex hydrocarbon has a higher percent by weight of carbon than the simpler one desired and in that the temperature may be so high in localized spots of a still that the most complex hydrocarbons which are held together loosely may decompose at a much faster rate than the circulation of the liquid provides for the removal of the products first formed. Too, there is some justification for the theory that the carbon formed has some effect in causing dissociation.

It is improbable that cracking is ever done on members of the paraffine series, inasmuch as straight run gasolene and kerosene have been removed at the start and inasmuch as the residuum from these would be solids, were they paraffins instead of liquids. So the materials worked on are mainly CnH_2n and CnH_2n-x compounds.

To form low boiling point hydrocarbons having more hydrogen in their molecules from heavy hydrocarbons which are in the series having less hydrogen in their composition means that what extra hydrogen furnished from hydrocarbons must leave some carbon in the elementary state. Attempts at hydrogenating very volatile fractions otherwise than the expense of a part of the heavy hydrocarbons with consequent reduction to carbon has not yet proven feasible commercially.

If it is assumed that petroleum oil has to be handled with consideration as to its chemical properties so as to avoid decomposition into unsaturated products which the oil refiner removes along with small quantities of the elements sulphur, oxygen, and nitrogen by treating with sulphuric acid and decolorizing filtration, how much greater must be the care exercised in designing equipment to produce an article from shale which will somewhere near compete when the elements hydrogen and carbon must actually be evolved in combinations which may be made useful.

Some point has been made that the oil refiner wastes money and material in removing odor and color because it is possible to make most American oil products sweet and nicely tinted. The claim is made that the refiner is largely responsible for the consumer having the idea that these are highly desirable qualities. Many conscientious oil shale process investigators agree with this because, for them, it is the easy way out. It has been shown frequently that the "treating" used by the present day refiner would cut out a large part of the shale retort product, which would be

just as useful in an internal combustion engine either for fuel or for lubrication, as the material now furnished. I agree with this in part. Up to a few years ago the refiner felt that he had to furnish a very volatile gasolene, say 68 to 70 Beaumé, containing no unsaturates but today he, himself, has let down the bars and is furnishing motor spirit not to exceed 54 Beaumé and having as high as 20 per cent unsaturates. Does the automobile driver kick at his engine performance when using this low volatile in cold weather? He does, but relief is looked for more pronouncedly from the automobile engineer in the furnishing of automatic thermostats, hot spots, air preheating, and so on than from the refiner. If then, the present day petroleum refiner furnishes what he can, perhaps the shale oil refiner is entitled to the same viewpoint.

There is no efficacy in itself in having particular shades of reds in lubricating oil. Outside of a relatively few large buyers, the average lubricating oil is prepared according to the specifications of the refiner himself and is sold at a price largely determined by him. A nicely tinted oil placed in a clean crank case of an automobile engine is soon blackened and is no better, as far as appearance goes, than much of the material worked upon originally. To be sure, the absence of a black color is indicative of the fact that the tar or pitch, which would tend to build up a gummy like layer on journals, has been removed, but, on the other hand, autoists have had the experience too of finding that fine appearing oils were entirely unsuited for an internal combustion engine because of being readily vaporized or decomposed.

As to odor in motor spirit, due say to sulphur and nitrogen compounds, there might be some questions, but there are a large number of stationary internal combustion engines running on producer gas which receive and discharge more sulphur without injury than could be supplied to the auto engine by the ordinary "sour" gasolene. I have not observed buyers of gasolene sniffing at the product when the filling station attendant is filling the tank. A tight cap prevents the autoist from being aware even of the natural odor of gasolene, so why worry about smell due to something else?

I believe the view to take with respect to the education of oil from shale is not one of ignoring altogether the present oil refiner's art and the public's demand but working at a retort which will prevent as far as possible the secondary reactions; evolving a refining system freed to some extent from the empiricism of the petroleum refiner, and educating the public to the essentials of volatility in motor spirit and of the desirable qualities, especially flash, viscosity and durability, for lubricants.

Research work has shown that isologous hydrocarbon show greater viscosity in those lower in hydrogen than those that are

higher. Therefore, the paraffin series compounds show less than the others. Should one frown on the heavier fractions of shale oil, which may have a lower hydrogen to carbon ratio than mineral oil products, merely because of unsaturation? I think not, at least for the lubrication of cold journals. The question then is, will there be more of a dissociation of the shale oil lubricant at high temperature than occurs in the use of the mineral oil product. Up to date, there is no indication that the unsaturates higher than those which are solids at ordinary temperatures are particularly affected. After a removal of a certain amount of sludge the rest seems to continue to have long lived lubricating power even though readily blackened by sunlight and oxidation. There is little question but that further research will permit the removal of the small amount of material causing this phenomenon without removing so much of the oil which, though unsaturated, is efficient.

While the business man's query as to "why not adapt the Scotch process to Rocky Mountain shales" may seem pertinent, it is wide of the mark because the oil that is produced is of secondary interest rather than primary and the Scotch retort provides for the recovery of ammonia and the partial destruction of the primarily formed suitable hydrocarbons rather than for the conservation of them.

Now if the vertical tube surrounded by high temperature fire gases is objectionable because of the creation of superheated void areas and because of a counter current travel of vapors and heat units, how much more objectionable are those devices which are horizontal tubes, likewise surrounded by high temperature fire gases, no matter whether they have some presumably ingenious conveyor system for the moving of the solid material or not. Where the Scotch tube, being vertical, may have the solid material providing a void area of some 50 per cent of it, the horizontal tube has a vapor area many times that of the small segment of the cross sectional areas used by the shale.

Vertical tubes having vapor ducts at the center of the column, so as to avoid secondary decomposition, would seem to be an improvement but are not materially so because the voids are there, the material at the shell is super heated, and vapor must find its way to the spaces. Improvement is occasioned by the fact that the heat flowing inwardly from the shell is not being opposed by the vapors flowing outwardly to the shell.

Any proposals for supporting the material on shelves, spirals, and the like within heated vertical tubes possess no merit, in fact provide a worse condition than that of the Scotch retort.

It has been proposed to circulate inert and preheated gases through the voids of a column of shale and condense and scrub the product distilled from them. This suggestion is a very interesting one as far as the effect on the shale is concerned because of the possibility of removal of the primarily formed prod-

ucts at a lower temperature than that at which they would boil with a resulting tendency to avoid secondary reactions or cracking. Many important engineering problems are involved. The heat units carried to the material must be furnished by a relatively large volume of gas of low specific heat which must be preheated. Queries as to amount of capital expenditure for large condenser and scrubbing capacity stoppage of preheated tubes by the carbon from dissociated hydrocarbons, maintenance of preheated tubes while preserving combustion efficiency, amount of fuel required on account of the necessity of cooling the large amount of heat carrying gas and then reheating it and so on are pertinent. Having run plants using the same principle for other classes of work, I am, perhaps, somewhat inclined to think of objections which are not readily met, but feel that the proposal is worth the expenditure necessary for the toy or pilot plant.

It is rather safe to predict that no process depending upon a number of small units can hope to succeed. Even though one of such may be able at the start to eke out dividends as a result of supplying specialties which represent almost nothing in the general aggregate of what may be called our oil consumption, nevertheless, a solution of the oil shale problem is not had if the unit cannot be enlarged to handle a big tonnage per day with the consequent cutting down of labor, repairs, power, etc.

It will not be safe to pass over lightly the developing, mining, and crushing of shale. I believe that any process requiring fine grinding with its expense and annoyance is out of the running at least at the present stages of the grinding and screening arts. Fine grinding costs real money and it does not appear that there is going to be a sufficiently high price for crude oil for some time to come to justify the expense. It is easy to see that the effect on the shale as a result of the use of some retort designs would indicate the desirability of a fine feed but this, in my opinion, is an argument against them. The screening to a fine mesh of a few tons of material somewhat comparable to ordinary clay does not indicate the problem to be met in doing this economically or cheaply in a plant running several thousand tons per day, whereas the breaking down to some ordinary size such as one inch does not create any problem at all.

The claim for an asset in the clay like residue is not justified except for the residual carbon. There has been a tendency to attempt to take some comfort from the possibility of a production of potash or the manufacture of portland cement. It should be realized that any material tonnage of shale run will be at points not commercially advantageous and where there is less justification for a cement plant than location at any one of numbers of other points where there are raw materials as good or better, and where one is close to a large consuming area and heavy freight rates do not apply. There is

nothing about this residue which is advantageous except that it is crushed and this, in my opinion, is not particularly important.

In retorting it would seem that, when each particle of shale is in turn brought into contact with the necessary heat supply, instead of having the same delivered through exhausted residual particles, a not excessive temperature such as 750° F. or 400° C. would be the maximum required. As indicated previously, a temperature beyond 300° C. starts cracking, at least qualitatively, but to do it at a rapid rate means the use of a temperature somewhat higher. While there may be a finishing temperature of say 400° C. in suitable retorting, there is provided only after the bulk of the organic matter has been previously removed.

Retorting proceeds progressively from the first distillation of any moisture present, to a production of oils, methane (CH_4), and ethyelene (C_2H_4). After reaching a temperature of 400° C. secondary cracked products are quantitatively formed to a pronounced degree. At 540° C. destructive distillation is pronounced with wastage of the dissociated hydrocarbons as hydrogen gas and carbon. Any nitrogen that exists in the shale may be lost in three directions, in the tail gas, in chemical combination in the tar (lost in treating), and in the residue. A too high temperature can decompose ammonia primarily formed. Any elementary nitrogen finding an outlet to the condenser will pass out of the system because the conditions existing there would not cause chemical union. The nitrogen in the shale probably combines best at a temperature of 390° C. or at a point approaching the advisable finishing temperature for the production of oil.

Some shales are so constituted that in the main only unsaturated hydrocarbons are formed primarily, while others are not so objectionable. Some shales contain material amounts of sulphur whose presence or absence should be determined invariably. It is not sufficient to have an ordinary laboratory distillation performed and then proceed to the consideration of acquiring property or building a plant. Research work should be done on the fractions so as to determine what may be done with them.

In retorting it is desirable that the heat from products of combustion be passed through a container wall which has a high heat conductivity and yet is inert to fire gases or will remain in place for years. Means should be provided for shifting the shale particles about so as to heat them quickly and remove them when the work is done, thereby making room for fresh ones. If an arrangement is provided which permits of localized overheating, the material in loco situ is subjected to destructive distillation. So the consideration of the method used for conveying is highly important.

The first material thought of for muffles is iron in some shape

or other. Steel, which is not cooled by some liquid or other as on the crown sheet of a boiler, tends to become distorted, buckled and loosen rivets, since, for fuel economy, as high fire-box temperatures as possible should be used. These objections, due to a high coefficiency of expansion and contraction, make its use unfeasible as a heat conducting medium in a stable furnace. Even the Scotch people do not use steel at the upper part of the column where the relatively low temperature of the partially cooled fire gases exist. Cast iron in plates of any size tends to crack and, on account of the thickness necessary, becomes burnt.

Since the material should be heated by rolling the particles about, a flat surfaced muffle furnace is indicated but the mechanism rabbling the material should not be of such character as to drag material from the feed to the discharge end. Some shales do not gum up or stick to rabble teeth but other richer shales do. It is not sufficient to conceive of the generality of the necessity for moving the material from one end of a suitably designed and properly heated hearth to another end, the arrangement for conveying should provide for gently and yet rapidly heating each individual particle without permitting any of such to remain quiescent and suffer localized overheating. The isothermal line should be in the material being put through not in a lot of dead material on the floor. The vapors evolved should not be allowed to remain at an elevated temperature any longer than possible, should not be subjected to a higher temperature than that necessary for their formation, nor be chilled with the effect that the heavier are being condensed and again distilled and, therefore, cracked.

Since our shale has an excess of carbon over hydrogen to form paraffin hydrocarbons and also contains oxygen which will selectively use hydrogen before combining necessarily with carbon, a closed cycle circulation of a small part of the tail gas which has been enriched by hydrogen from any source in the refinery is indicated. The benefit derived mainly will be due to the sweeping of the vapors from the furnace and a questionable one of saturating some of the hydrocarbons. At times the presence of hydrogen has seemed to be beneficial in lowering unsaturates but, without careful checking in connection with large scale operations by excluding all other known effects from an interpretation of results, this has not been established. However, circulating a small quantity for the physical benefit and not to a sufficient extent to rob the furnace of much heat and in turn burden condensers and scrubbers seems advisable.

The Tail gas produced should be kept to a minimum. A large production indicates undesirable retorting. Nevertheless, some shales produce more than others so that each presents a problem by itself. However, a large part of the heat necessary for

retorting may be derived from this gas used in combination with the residual carbon in the spent shale. With large tonnage units it appears that the heat derived as above will have to be boosted by some 40-50 pounds of coal, or its equivalent, per ton of average material.

The mechanism rabbling the material in the furnace should have no parts moving with respect to each other; should be capable of adjustment with respect to the floor; should be easily replaceable in a few minutes in case of breakage or repair; should be of cheap materials not needing the services of high-class mechanics for adjustment or repair; should not be composed of heavy moving parts requiring a large amount of power, and should be so designed that the layout may be operated by the laborer of ordinary skill.

Owing to the fact that the incoming raw material fed to a long hearth is at atmospheric temperature, it is questionable whether there would be any gain in using a heat exchanger for the combustion air before passing the products of combustion to the stack. With a large enough furnace the underneath flues could be so designed that the gases flowing counter current to the shale would remove all the useful heat. The arrangement I have in mind for this work has been used by me in other connections, so that numerous engineering details have been developed to the point that they are known to work. However, the purpose of this paper is to create a desirable interest and present enough chemical and engineering generalities and requirements to be of assistance, not to present my particular apparatus, so it will not be described.

As to refining the green oil first produced, enough indication has been given previously as to the fact that motor spirit of today coming from cracking stills is approaching the kind of material which may be produced from shale oil. However, without higher hydrogenation, shale oil of the same end point actually has a higher heat unit value per gallon than the gasolene derived from petroleum. A gramatom of carbon has a higher heat value than a gramatom of hydrogen; therefore, the higher the percentage of carbon to hydrogen, the higher the heat value of the combination.

As to the odor, much can be refined out at a considerable loss and some expense, doing it by the present methods. However, some experimental work has been done in part to indicate that relatively inexpensive methods may be applied to overcome much of the present objection.

As to the heavier products some indication was given previously to show that the conception that so-called saturated lubricating oils were the only desirable ones are erroneous. As a matter of fact, lubricating oils of today are not known to be composed of the hydrocarbons of any one special series. They

are produced largely by hit or miss methods to conform to certain physical specifications. Now, if any objectionable or gummy material is removed from shale oil lubricants, and they then conform to the essential requirements, a little more research will provide the means for taking care of the less essential without requiring the loss due to the present petroleum standards of refining. In any event, shale oil production and refining is bound to require more care than the present regime. I believe the time is nearly at hand when the so-called "practical refinery man," with his nursing a few tricks of the trade close to the chin and running things with a high hand according to rule of thumb methods, will be replaced by the trained thinker. Metallurgical engineering has been remarkably improved in the last decade by the persistent exchange of technological ideas, with the effect that the fellow from the ranks, whose sole asset was that he was a natural boss, has passed to the discard. This has been the policy to a lesser extent in the chemical industry.

In several cases, the present day oil refinery is not up to the technological practices of several other businesses demanding the application of scientific principles. The demand for products has increased so rapidly, and the business has been so closely held by pioneers, that there is much unwarranted smugness due to prosperity, which has been forced from the outside, rather than originated from within. It is well to suggest, that, to save time and money in the development of a remarkable resource, the viewpoint, now held largely, be changed in favor of securing the co-operation of the metallurgical or chemical engineer, who is accustomed to handling solid material on a large scale and to design large mechanical furnaces and other process equipment for the purpose of extracting values from raw mined-substances. The development should be interesting along the lines suggested to those crowds having the venturesome spirit necessary in mining and metallurgy.

TO SUMMARIZE:

We have no Rocky Mountain shale industry as yet and, in my opinion, shall not have, because of the narrow margin and complexity, unless we have the formation of a highly trained and experienced research organization consisting of executives, laboratory chemists, engineers, draftsmen, and so on, comparable to those made use of by many prominent concerns, backed by sufficient capital, not only for evolving a complete scheme of operation, but for financing the building of a large plant later.

We should not confine ourselves to an adaptation of the Scotch retort, but should use mechanical furnaces capable of handling large tonnages, and so constructed as to ruggedness, accessibility, and simplicity as to require a minimum of ordinary labor.

We should use the present petroleum refiners' methods as far as possible, but make obvious changes to fit oil from shale.

We should educate the public in the non-essentiality of some of the specifications now applying.

We should encourage properly protected speculative financing by crowds accustomed to the exploitation of low grade but voluminous resources.

OIL SHALES

J. A. Ede

In the discussion of these shales I hope I shall not be charged with plagiarism when it is observed that much of what I have to say is derived either directly or suggestively from passages which have appeared under the names of different authors. In introducing this discussion, I wish to state that I am one of those who believe that our oil shales will very soon form an important national industry. Although upon very reliable authority we are informed "that large amounts of money will have to be invested before the oil shale industry becomes of commercial importance; that a complete plant handling 1,000 tons of shale a day will cost in the neighborhood of $1,000,000 to $5,000,000. If such a plant should yield 42 gallons of oil a ton it would probably require 1,300 such plants operating 365 days a year to supply the volume of crude oil that was consumed in this country in 1920." The consummation of the object strived for, nevertheless, may be achieved at an earlier date than anticiplated. We are disposed to believe the time will not be long because the subject of producing commercial oil from shale has not only become a national but a world problem, as stated very clearly in Dr. Alderson's paper prepared for the American Mining Congress Journal.

All who listened to Mr. Skinner's paper must have been impressed with the effort being made to solve the problem of a commercial process. When we realize that throughout the world there are hundreds approaching the same subject with the same zeal and scientific training, should we be surprised to learn that a commercial process suitable for our shales had been found? An eminent writer wrote that genius was perseverance. It was this faculty that helped Ke Kule to solve the structural formula of benzene and later Perkin to blunder into a method of preparing aniline dyes when looking for quinine. However much we may deplore the money lost in the attempts of our oil shale men in their search for a commercial method, we cannot less than admire their unswerving perseverance and indomitable courage, which inspire us with a belief in their ultimate success.

Our shale deposit appears to fall into the category of "low grade proposition," such as our "porphyry copper ores"—one or two dollar gold ores—disseminated lead and zinc ores; in

distinction to "glory hole" deposits, bonanza lode or fissure deposits; and an oil gusher. The meniscus of the economic cycle ranging from genesis to exhaustion of organic and inorganic commodities is now at that point of the curve where quantity compensates for quality, and speculation gives place to a measurable and determinable proposition. In considering our oil shales we agree with Dr. Alderson's summary that our first objective should be to establish the commercial value of the oil factor and ammonium sulphate product. We realize that these products present the chief inducement for the exploitation of our shales, and furnish the most tangible prospect of establishing a lucrative oil shale plant. We have no need to worry about our by-products, but we cannot afford to ignore them.

Mr. A. W. Loyce, of the Chemical Foundation, referring to tar obtained from the shales found in Tyrol, states that it contains a product known as ichthyol which is used in medicine as an antiseptic for the intestines, and used instead of iodoform for curing wounds. From a commercial point of view a matter not worth taking into account, but from a humanitarian standpoint a boon—"every good gift and every perfect boon is from above."

In conjunction with chlorine and sulphur, the by-products of our shales played an important part in the war as an offensive weapon on both sides. It is, I believe, conceded by those who should know, that if the Germans had taken advantage of the havoc made by their first discharge of poisonous gas which for a time made a gap of five miles in the Allies line and opened a pathway to Ypres, they could have reached Paris and Calais. It is the opinion of our chemist that the fate of the next war will be decided by the combatant most plentifully furnished with chemical factories. The members of the Chemical Foundation are today making a strenuous effort to educate the public and impress our Government with the necessity of placing an embargo on dyes sent to this country. They plead that our Government shows the same solicitude for our dye industry given it by the German Government, whether autocratic or democratic. This German Government watches with the eyes of Argus any encroachment on her world-wide market of this special product. We should know that dye factories can be converted into explosives and poisoned gas factories over night, and were so converted during the war. We have to regard in future every chemical factory as a potential arsenal, and consider its equipment with the same jealous care we attach to our fleet and army. Germany cannot be censored for providing for the safety and security of her people.

Victor C. Alderson, president of the Colorado School of Mines, refers to the oil shale as a "Potential World-wide Industry" in the article prepared for the American Mining Congress. After

reading this paper, I was impressed for the first time with the universal research work now in progress throughout a great portion of the globe. He depicts an oil field coextensive with the world. In some countries the oil shale has developed into a national industry. Countries not favored with deep well deposits find they have oliferous shales. Bulgaria is mentioned as being in this class. Italy, Germany, the British Isles and her Dominions, Norway, South America, Spain, and other localities are mentioned as possessing shale deposits. It is possible that in the race for supremacy in the treatment of the shales, America may not lead the way. It is a trite old saying that necessity is the mother of invention, and I was not surprised to learn that little resourceless Esthonia "has developed the industry till today, the use of the oil shale is more varied and more successful than anywhere else in the world, not excepting even Scotland."

The oil shales differ very materially in their physical and chemical structure. They differ in regard to their genesis; the time of their deposition and in the order of their formation. For this reason it has appeared to me that the shales of Colorado and Kentucky, Scotland, and some other parts of the continent, will require a different process of treatment adapted only to contiguous localities and analogous properties. And it behooves us to watch closely the progress of development in the treatment of oil shales, wherever work along these lines is being done. Our consuls in different countries should be alert to secure for us all possible data pertaining thereto.

The Bureau of Mines can assist in getting this information and present it in a form that should be highly appreciated by the legitimate oil shale man. I am afraid that the work of the Bureau of Mines is not appreciated to the extent it deserves.

In referring to the different shales I wish to recognize the following contributors: The Bureau of Mines, the Mellon Institute of Technical Chemical series (Hamon and Padgett). The Chemical Foundation (Mr. A. W. Loyce) and Dr. Alderson, President of the Colorado School of Mines.

Messrs. Gavin, Hill, and Perdew, serial No. 2256, refer to the Scotch shales as producing:

Naphtha (including scrubber Naphtha) 9.9% 450° and point
Burning oil 24.7%
Gas and fuel oil.....24.4%
Lubricating oil 6.6%
Wax 9.5%
Loss including still coke 2%.....24.9%

Cost approximately $1.05 per barrel of 42 U. S. Gallons—not applicable to American conditions.

Mr. A. W. Loyce of the Chemical Foundation in reply to my inquiry informs me that in Tyrol the residue from the retorts

contain as much as 12% of combustible substances being burnt in the furnace. The yield consists of:

Gas	4%
Ammoniacal liquor	8%
Crude oil	12%
Residue	76%
	100%

A ton of shale yields: naphtha 17 lbs., crude oil (green oil) 133 lbs., ammonium sulphate 27 lbs. From 220 lbs. of green oil are then obtained 64 lbs. of burning oil, 37 lbs. of lighting oil, 23 lbs. of middle oil, 32 lbs. of paraffin, and 15 to 20% loss. The tar we have before referred to as containing ichthyol.

Messrs. Hamon and Padgett in their book on the examination of petroleum, page 191, "Evaluation of Oil Shale," give the following figures based on the result of one hundred and thirty-two analyses published by the United States Geological Society; forty-two analyses by the Colorado School of Mines, and thirty-one analyses from other sources.

Fifty-four of the analyses are on Colorado shales, fifty-two on Utah shales, forty-five on Wyoming shales, and fifty-four on Nevada shales.

Analysis	Character	Unit	Minimum	Average	Maximum
205	shale oil	gal. per ton	0.3	38.0	90.0
205	shale oil	specific gravity	0.832	0.890	0.950
163	ammonium sulphate	lbs. per ton	0.4	9.4	20.00
64	gas	cu. ft. per ton	400.0	3800.0	5600.00
26	water	gal. per ton	2.0	4.8	8.5
26	spent shale	lbs. per ton	900.0	1200.0	1800.0
26	sulphur	per cent	0.25	0.80	5.20
16	heating value	B. t. u.	1000.0	4500.0	8000.0
6	carbon	per cent	.083	22.5	37.2

The authors state: shale distillation with steam yields a few more gallons of oil per ton than dry distillation, and the specific gravity of the oil is between 0.03 and 0.04. Steam distillation also increases the quantity of ammonium sulphate about two and one-half times the value obtained by dry distillation.

Dr. Alderson referring to Esthonian informs us that the local name of the shale is Kukersit, and that it was first discovered at Kukers. Analysis of good kukersit gives on an average the following result:

Moisture	3.74 per cent
Hydrocarbons	61.42 per cent
Coke	7.68 per cent
Ash (plus CO_2)	27.00 per cent

From repeated tests, sulphur in the best grades, has been determined as follows:

Total sulphur	3.48
Volatile sulphur	0.43
Constant sulphur	2.05

We find in Illinois, that some of our shales furnish oil. A shale overlying the roof of No. 2 coal shows about 9 gallons to the ton. I only tested one sample.

The universality of this oil shale inquiry, the fact that so many countries are engaged in trying to work out a successful process for its treatment presents a state, or condition, we cannot recall. I believe this condition should appeal to the intelligence of our statesmen, as a question related to the welfare of our country. A challenge to our chemist at Ypres was immediately taken up with the result that our chemists in a very short time showed their superiority, but they cannot afford to lie on their oars. They cannot afford to be satisfied with results accomplished but fight on. The battle is not always with the strong. It was not the hare but the tortoise that won the race. Let us keep our eye on this tortoise. Before the close of the war we realized that America was not surrounded by any natural boundaries of defence, that her future commerce would in future be in closer contact with her competitors, and her ocean boundaries would permit of no "lap" in the race for commercial supremacy. The old lines of demarcation have disappeared and our transatlantic intercourse is as convenient as our transcontinent. From New York, Honolulu can be reached through the same channel of communication as San Francisco. Believing as I have before quoted, that every chemical factory is a potential arsenal, I should like to feel satisfied that our statesmen recognize this fact, and that exploitation of our hydrocarbons, nitrogen, chlorine, sulphur, etc., furnish products subject to a chemical treatment.

Our deep well petroleum pools will be a fruitful source for many years to come. I am not a pessimist in regard to this form of oil supply. I have no doubt whatever, but many hidden "structures" will disclose the locations of new oil fields for many years to come, but as certain as our bonanza deposits are being displaced by disseminated deposit, so in time we shall expect our large oil gushers to be replaced by oil furnished by a medium which can only produce it after a chemical and mechanical treatment.

National Gold Conference

OPENING SESSION, TUESDAY, OCTOBER 18, 1921

The Conference convened at the Congress Hotel October 18, 1921, at 2:30 p. m. H. W. Seaman presiding as Chairman, opened the conference by requesting a report of H. N. Lawrie, chief of the Precious and Rare Metals Division of the American Mining Congress, concerning the status of relief legislation for the gold mining industry. Mr. Lawrie made the following report:

The McFadden Gold Bill, H. R. 5025, was referred to in Senate debate September 23. Senator Ashurst, Democrat, of Arizona, asked Senator Oddie, Republican, of Nevada, whether or not he had received any response to a letter he wrote the Secretary of the Treasury Aug. 17 last, transmitting a communication relating to the gold mining situation. Senator Oddie replied that he had not yet received an answer. The letter and communication are as follows:

August 17, 1921.

My Dear Mr. Secretary:

The following Senators have signed the enclosed resolution relating to the existing crisis in the gold mining industry of the nation and the importance of maintaining the gold standard of the world:

Tasker L. Oddie (Nevada)	Wm. E. Borah (Idaho)
H. O. Bursum (New Mexico)	T. J. Walsh (Montana)
Chas. L. McNary (Oregon)	Andrieus A. Jones (New Mex.)
Lawrence C. Phipps (Colorado)	Henry F. Ashurst (Arizona)
Ralph H. Cameron (Arizona)	Key Pittman (Nevada)
Samuel D. Nicholson (Colorado)	John B. Kendrick (Wyoming)
Thomas Sterling (South Dakota)	Robt. N. Stanfield (Oregon)
Samuel M. Shortridge (Cal.)	W. L. Jones (Washington)
F. R. Gooding (Idaho)	Peter Norbeck (South Dakota)
Hiram W. Johnson (California)	Miles Poindexter (Washington)
H. L. Myers (Montana)	E. F. Ladd (North Dakota)

We will appreciate your considerate and early attention to the subject matter of the resolution and a detailed and complete reply to the questions therein presented.

Very truly yours,
(Signed) Tasker L. Oddie.

Hon. Andrew W. Mellon,
Secretary of the Treasury
Washington, D. C.

RESOLUTION ON THE GOLD SITUATION

TO BE SURMITTED TO
The Honorable Andrew W. Mellon,
Secretary of the Treasury
BY
Members of the United States Senate

Whereas, Gold is the standard of value and the basis of all credit, and its production is vitally important to the financial and commercial life of the nation and of the world; and

Whereas. The production of gold in the United States has declined from $101,035,000 in 1915 to $49,509,000 in 1920, a decline in excess of 50 per cent, due to the fact that the price of gold is fixed by the government, while the cost of producing gold has greatly increased; and

Whereas. The consumption of gold in manufactures and the arts increased from $37,820,000 in 1915 to $75,490,000 in 1919, an increase of 100 per cent, due to the excessive demand for luxuries and the fact that the government has been supplying the industrial consumers of gold with the metal at the pre-war price; and

Whereas. The normal process of deflation will not be sufficiently rapid to prevent the further decline in the production of gold and the wastage of developed gold ore resources due to the flooding of the mines; and

Whereas. The gold standard cannot be permanently maintained without gold production, and the nation is confronted today by the prospect of a heavy drain upon the monetary gold reserve which will necessitate a still further curtailment of credit; and

Whereas, Representative Louis T. McFadden, Chairman of the Banking and Currency Committee, has introduced a bill, H. R. 5025, in the Sixty-seventh Congress which provides for the maintenance of the normal gold production of the United States by an equitable adjustment between the producer and the industrial consumer of gold; and

Whereas, H. R., 5025, containing a provision to levy an excise, in accordance with the Constitution has been introduced in the House of Representatives and referred to the Ways and Means Committee thereof; and

Whereas, H. R. 5025 involving both the policy and administration of the Treasury Department has been referred by Chairman Fordney to the Secretary of the Treasury for an opinion; now, therefore, be it

RESOLVED, That the undersigned, members of the United States Senate, urge upon the Secretary of the Treasury the significance of his reply to Chairman Fordney in determining the status of the gold mining industry, which is vitally important to the maintenance of the gold standard and the financial security of the nation; and be it further

RESOLVED, That if upon the analysis of the Secretary of the Treasury reasons cannot be definitely assigned for opposing the provisions of H. R. 5025, the Secretary is requested to endorse the same in order to expedite the action of the House and permit the bill to be considered by the Senate; and be it further

RESOLVED, That if the Secretary of the Treasury has specific reasons for opposing the provisions of H. R. 5025, he is hereby urgently requested to formulate a proposal for enactment by Congress: first, to protect the gold mining industry from destruction, which is a serious matter irrespective of the fact that its operation is necessary as the basis of our monetary system; and second, in anticipation of the heavy foreign drain upon our gold reserve, to provide for augmenting said reserve from sources of domestic production and thereby lessen the need for the further and extensive curtailment of credit which otherwise would result.

The Secretary of the Treasury replying under date of September 30, 1921, as follows:

My Dear Senator:

I received your letter of August 17, 1921, presented on behalf of Senators from the Western States, and have been glad to give careful consideration to the enclosed resolution of the Senators with respect to the gold mining industry and the bill which has been introduced in the House of Representatives (H. R. 5025), "To provide for the protection of the monetary gold reserve by the maintenance of the normal gold production of the United States, by imposing an excise, for revenue and other purposes,

upon all gold used for other than monetary purposes, and by the payment of a premium to the producers of newly-mined gold, and providing penalties for the violation thereof."

The Treasury's position with respect to this bill has already been stated in my letter of May 9, 1921, to the Chairman of the Committee on Ways and Means, a copy of which is enclosed for your information. The developments which have occurred since this letter was written have confirmed the Treasury's views and have shown that as commodity prices return toward normal and costs become stabilized on a lower level relief should gradually come in the ordinary course of events from the difficulties of which the gold mining industry has been complaining. Already there are signs of some improvement.

The Bill presents two main questions, the first of which is of chief concern to the Treasury, namely, whether it is necessary or advisable to pay the proposed premium of about 50 per cent on newly-mined gold and impose a tax on gold used in the arts in order to protect the monetary gold reserve of the United States. I think it is clear that there is no need for the legislation from this point of view. The market for gold is international, and in the present state of the exchanges the United States draws gold from every quarter and receives practically the whole gold production of the world, with the exception of what goes to the arts. The effect has been an unprecedented gold movement to this country during the past year or more, which has resulted in net imports many times greater than this country's normal annual production of gold. During the calendar year 1920, according to the reports of the Federal Reserve Board, the net imports of gold into the United States in excess of exports aggregated about $95,000,000. In the present calendar year, down to September 20, 1921, the imports have amounted to over $545,000,000, as against total exports of about $13,500,000, or an excess of imports over exports amounting to $532,000,000. The figures are not available, of course, as to domestic gold production in 1921, but for 1920 the Director of the Mint reports that the total is estimated at $51,048,526. The figures for earlier years, with figures as to the amounts of gold used in the arts, are given in the Annual Report of the Director of the Mint for 1920, on pages 72-75. A copy of this report is enclosed for your information. The amounts of gold used in the arts, it appears from this report, include substantial amounts of old material which do not drain the monetary gold supply. I enclose also a copy of the report issued by the Bureau of the Census under date of September 24, 1921, with respect to the condition of the gold mining industry in the year 1919.

The result of the operations of the past few years has been to accumulate in the United States the largest monetary gold reserve in its history, and the largest stock of monetary gold

in the world. The total amount of monetary gold in the country on September 1, 1921, according to the enclosed monthly circulation statement of that date, is $3,377,417,980, of which $2,641,061,000 was held on August 31, 1921, in the reserves of the Federal Reserve System. Since that date the reserves have been augmented by additional imports, and on September 28 were $2,725,966,000. Imports of gold are continuing at a heavy rate, and there are as yet no indications that the movement is at an end. For your information in this connection I am enclosing copies of the statements issued by the Federal Reserve Board showing the conditions of the Federal Reserve Banks as at the close of business on August 31, and September 28, 1921. I enclose also a copy of the Federal Reserve Board statement of September 30, 1921, which shows the imports and exports of gold from January 1 to September 20, 1921, and their distribution by countries.

These figures show that there is no shortage of gold in the United States, and that there is nothing in the position of the gold reserves which makes it either necessary or advisable to encourage by subsidies or other artificial means new mine production of gold. As a matter of fact, the monetary gold supply of this country, instead of decreasing, has greatly increased in recent years, and is more than ample to meet the credit and currency needs of the country. The monetary stock of gold of the world has also increased during the past ten years, it has been estimated, by as much as $2,000,000,000.

The other question raised by the bill is one of legislative policy, on which the Treasury is not called upon to express an opinion, namely, whether a subsidy or bonus should be paid to domestic producers of gold because of the hardships which the gold mining industry has suffered during the period of abnormal war costs. As already indicated, I believe that these conditions will gradually right themselves without a Government subsidy, and that the difficulties in which the producers of gold have found themselves in the meantime are due chiefly to the fact that gold is the standard of value. It is true, of course, that the price of gold, as the monetary unit, is fixed by law, but this, in turn, gives compensating advantages to gold producers in other times, when production costs are low, because of the assured market at a fixed price which is always available. It is difficult in these circumstances to see what special equity there is in the claim for a premium when costs are high. There would certainly be no suggestion of a discount if costs were low.

The tax which the bill would impose upon the use of gold for non-monetary purposes, while in form a tax, would in fact put restrictions upon the free convertibility of the currency into gold. If gold could not be used, except under heavy pen-

alties, for anything else than money, its value would be impaired and there would be, in effect, a clog on the convertibility of the currency. One dollar in paper currency, in other words, would not buy one dollar's worth of gold, if the gold was to be used in the arts. Gold in large quantities, moreover, is imported from abroad and even under legislation like that proposed could be purchased in foreign countries in the open market. To put a penalty on foreign gold thus brought into this country for non-monetary purposes, in order to pay a premium to domestic producers, would seem to have little or no relation to the protection of our own monetary gold reserves.

I find upon investigation that in the previous administration there was appointed a committee to consider the condition of the gold mining industry, and that its findings were published in February, 1919, and approved by my predecessors as Secretary of the Treasury. It seems to me that the report of this committee is interesting in the present situation, and I am therefore enclosing a copy for your information.

I have noted particularly the request made in the resolution which was presented with your letter that if the Treasury be opposed to H. R. 5025 it formulate a proposal for enactment by Congress to relieve the gold mining industry and protect the gold reserve. As already indicated, I believe that no legislation of this character is needed in order to protect the gold reserve, and therefore have no proposal to suggest for this purpose. On the question of possible legislation to provide a bonus for the mining of gold, the Treasury also has no proposal to submit, believing, as indicated herein, that if such a bonus were to be granted it would come as an exercise of legislative discretion by Congress.

Very truly yours,

(Signed) A. W. MELLON.
Secretary.

Hon. Tasker L. Oddie,
United States Senate,
Washington, D. C.

The letter of May 9, 1921, to the Chairman of the Committee on Ways and Means, to which reference is made in the above letter, was as follows:

May 9, 1921.

My dear Congressman:

I received your letter of May 3, 1921, requesting my views as to H. R. 5025, introduced by Mr. McFadden, "To provide for the protection of the monetary gold reserve by the maintenance of the normal gold production of the United States, by imposing an excise, for revenue and other purposes, upon all gold used for other than monetary purposes, and by the payment of a pre-

mium to the producers of newly mined gold, and providing penalties for the violation thereof."

I hold the general view that the difficulties in which the gold producers find themselves are due to the fact that gold is the standard of value. In a sense this is the penalty which gold pays for being the standard. These difficulties should gradually adjust themselves without a Government subsidy as deflation progresses and commodity prices return toward normal. As I see it, the question of whether the Government is to give a bonus on these terms to a special class of producers is a question of policy which addresses itself to the judgment of Congress, and not a question upon which the Treasury is in a position to express an opinion.

Very truly yours,

(Signed) A. W. MELLON,
Secretary.

Hon. Joseph W. Fordney,
House of Representatives,
Washington, D. C.

The request was made to read Senator Oddie's reply to the Secretary of the Treasury. Because of the fact that Senator Oddie's reply was in the hands of the printer, and no other copy being available, it could not be placed before the conference, however, it was presented in full before the Convention on the evening of October 18, and is as follows

UNITED STATES SENATE

October 19, 1921.

My dear Mr. Secretary:

This will acknowledge receipt of your reply of September 30th to my letter of August 17th, transmitting the resolution upon the gold situation signed by the Senators from the Western States.

I have given careful consideration to the gold policy therein enunciated, which so far as I can see, is identical with that of the last Administration. For this reason I deem it my duty to invite your attention to the serious manner in which that policy has affected our domestic industrial condition, our export trade, and the maintenance of the gold standard.

The report of the committee appointed in the previous Administration to consider the condition of the gold mining industry approved by your predecessors as Secretary of the Treasury to which you refer, also expressed the opinion that a decline in commodity prices was going to be the natural solution of the

problem, but those prices continued for two years after that to ascend to such heights that the mines were forced to shut down, showing that the prophecy of the committee was in error.

This report is interesting, but because of my practical knowledge of and familiarity with the conditions which prevail in the gold mining industry, I cannot agree with the committee's conclusions.

You have expressed the opinion in your letter of May 9th to the Chairman of the Committee on Ways and Means, and in your letter of September 30th to me, that as commodity prices return toward normal and costs become stabilized on a lower level, relief should gradually come in the ordinary course of events from the difficulties of which the gold mining industry has been complaining. The wholesale index number of the Bureau of Labor Statistics has been recently ascending over the low point established in June and still remains over 50 per cent above the wholesale price level of 1913. This would show that the general price level is rising instead of declining.

It must be apparent that as the price level increases the economic pressure upon the gold mining industry will correspondingly increase. The retail price level upon which the purchase of mining materials would be more accurately based has not yet descended proportionately to the level of wholesale prices. No change in the price level has yet taken place which would enable the profitable operation of those gold mines which have discontinued operations during this period of economic stress. In fact, the normal condition of the industry cannot be restored unless the purchasing power of the 1913 dollar is restored. I fully appreciate that over a period of many years there may be a remote possibility that the purchasing power of the 1913 dollar will have returned, but I cannot conceive the possibility that the purchasing power of the dollar, in terms of material and labor utilized in the gold mining industry, will return in time to save the ore reserves from loss through caving in of the mines which have been shut down and filled with water during the period 1916 to 1921.

. It must also be apparent that we can not hope to maintain normal production of gold in the United States, which for the decade prior to 1916 annually averaged $95 millions, unless the purchasing power of the 1913 dollar is reestablished. The object therefore in suggesting that the loss in the purchasing power of

the gold ounce be temporarily compensated is to conserve the investment which has been made in the gold mining industry prior to 1916 from wastage and loss, and thus to conserve the gold producing power of the nation. The improvement which you indicate has already taken place, cannot refer to increased activities in any but those few properties which have under very great difficulties and expense to their ore reserves maintained operations over this critical period.

The United States Geological Survey in "Mineral Resources of the United States in 1920" makes the following comment with reference to condition of gold mining industry: "Gold mining continued in a greatly depressed condition and the value of the country's output decreased to less than $50 millions. Less than half of the gold mines of the country were active and some of the large mines were closed permanently." Based upon reports of gold production for the first six months of 1921, a total production for this year will probably not exceed $40 millions, a decrease of 20 per cent from that of 1920. The President's conference on unemployment through its committee on emergency measures and mining recommended on October 13, 1921, as follows: "Gold mining suffers from the excessive cost of supplies and other items, and the value of the gold output being fixed as against material advances in cost has operated to restrict the employment of labor in gold mines." These are not signs of improvement but rather of further depression in the gold mining industry.

You state that "the monetary gold stock of the world has also increased during the past ten years it has been estimated by as much as $2,000,000,000." With the enormous increase in the paper currency of the world, the marked decline in gold production, and the increased gold consumption in the industrial arts, the ratio of gold to notes has declined from 66 per cent in 1914 to less than 10 per cent in 1920. The paper currency of the world is now eleven times as much as at the beginning of the war, and the available supply of gold from sources of new production bears an increasingly diminishing ratio to the note circulation. The gold holdings and paper currencies of the fifty principal countries for which figures are available show that the ratio of gold to notes was 66.8 per cent in 1914, 17.9 per cent in 1918, 13.7 per cent in 1919, and 9.3 per cent in 1920.

During this same period, in addition to these extensive note

issues, world national debts expanded from $43 billions at the beginning of the war to $212 billions at its close, and advanced to about $256 billions at the end of the first year of peace, and at the end of the second year were approximately $300 billions. The annual interest charges have advanced from $1.75 billions in 1913 to $12 billions in 1920. Both the principal of this debt and interest are payable in gold. It would appear from these facts that the increase of $2 billions in the world's gold stock, which you have cited, is a very meager addition as compared with the existing obligations arising from the need for currency redemption and the payments of debts and interest.

The experience gained since the termination of the war indicates that at the earliest opportunity the people of every country will desire to return to their pre-war monetary customs. Those who have sustained losses through the purchase of paper notes which have since depreciated in value are aware that the use of this paper as an economy in the use of gold is a great fallacy. The preference which had developed for the use of paper notes will be replaced by a demand for the actual circulation of gold. The very fact that the banks are expected to discourage the use of gold as currency would seem to be evidence that they are by no means confident that the people will not demand gold in circulation whenever the reserves are released. The world stands bankrupt today for lack of gold.

The net importation of gold into this country from 1914 to September 20, 1921, has been $1.3 billions. To this extraordinary extent we have depleted the monetary gold stocks of the countries of the world, which has been one of the fundamental causes for the depreciation of foreign currencies. For the period January 1st to September 20, 1921, the net importation of gold amounted to $531.7 millions of which the net importation from Europe amounted to $401.8 millions or about 76 per cent. France with its greatly depreciated currency contributed $151.6 millions of this gold, while Sweden contributed $55 millions, and England $154 millions.

To the depreciation in the European currencies in particular may be attributed the marked decline in our export trade. The present industrial depression in this country is largely due to the falling off in our export trade. The external purchasing power of all foreign countries of the world must be increased in order to restore normal conditions in our export trade. A

redistribution of the gold which we have acquired since the beginning of the war is a prerequisite to increasing the external purchasing power of European countries and restoring financial poise to the balance of the world. Europe's need for part of our excessive supply of gold should not be forced to wait upon her ultimate recovery if we are to consider the dependence of our own nation's prosperity upon the restoration of export trade. As rapidly as one country after another approaches a more stable condition in its currency, an increased demand for gold will occur.

Such a condition compels us to adopt a gold policy that will make possible a redistribution of the gold which we have acquired during and since the war as soon as conditions permit. Under such a policy we should not permit that gold to become the base of our credit and currency structure, as it could not then be released for export without forcing a rapid deflation. Under such a policy the United States should occupy the position of trustee for this newly acquired gold.

The total reserve of the Federal Reserve Banks on August 31, 1921, amounted to $2.79 billions. If these reserves were to be reduced by the $1.33 billions of gold acquired during the war and post-war period, the gold cover of the Federal Reserve notes in circulation on that date would be 34.8 per cent, which is considerably below the minimum of 40 per cent provided in the Federal Reserve Act, and considerably less than half the gold cover reported of 88.5 per cent. This statement indicates that some of this newly acquired gold is already a part of our credit and currency structure and could not be released without a still further contraction in the volume of our credit and currency. This does not indicate that under such a gold policy, we have an excessive amount of gold to accomplish the work which it will be called upon to perform both national and international.

There is a still more important consideration in a gold policy to redistribute this newly acquired gold than that which relates to the revival of our export trade. There is no question that the unstable condition of the foreign exchanges and their depreciation seriously menaces the maintenance of the gold standard. If the influx of gold continues at the present rate, and you state that there are no indications that the influx may end, it will not be long before the United States holds the gold stock of the world. It must be apparent that if foreign exchanges

continue to depreciate, with a continued loss of this gold to us, that the increased disparities from the gold standard par would still more seriously jeopardize the security of gold as the international monetary unit and the medium of exchange. It would not seem possible for one nation to maintain a monetary unit as a medium of exchange when that unit could not be utilized in the trade transactions of the balance of the world.

This gold was purchased by us with very cheap dollars and it will have to be repurchased by these foreign countries with much more expensive dollars in terms of labor and there will naturally arise a great resistance to a monetary system which thus imposes such a great burden upon the peoples of so many countries. Our problem, therefore, is to assist these nations in every way possible to recover their former gold stocks and thus enable them to appreciate their currencies to the gold standard level. If we fail to render them assistance, some other unit will be adopted as a matter not only of convenience but of necessity. As a creditor nation, we have become still more involved in the world's financial structure, and our continued position as such is dependent upon the maintenance of the gold standard.

From the report of the Director of the Mint which you have submitted, the "new gold" which was sold by the Treasury Department through the Mint Service to the industrial consumers, principally for the manufacture of jewelry, amounted for the years 1914 to 1919 inclusive, to $232 millions. The National City Company estimates that the amount of "new gold" sold by the Mint Service for consumption in the arts in 1920 amounted to $60 millions. This makes a grand total of $292 millions of "new gold" which was diverted from the monetary reserve for the manufacture of gold articles largely to satisfy the demand for luxuries. This statement excludes the "old material" in accordance with the differentiation made in your letter, which reduces considerably the total amount of gold consumed in the manufactures and the arts.

It is interesting to note that during the calendar year 1919 the United States exported an excess of gold over its imports in the amount of $291.6 millions. Had this "new gold" not been withdrawn from the monetary reserve for industrial consumption it would have been sufficient to more than replace the amount of gold lost by excess exportation in 1919, and would have removed, to a large extent, the need for putting into effect

the drastic measures of deflation which were adopted by the Federal Reserve Board as a last resort to preserve the gold reserve ratio from declining below the legal minimum prescribed in the Federal Reserve Act. Had this gold been conserved for monetary uses instead of dissipated in satisfying the demands for luxury, the industries of the country would not have become paralyzed by a deflation so rapid and extensive as the one which was imposed.

In the testimony of Governor Benjamin Strong of the Federal Reserve Bank of New York before the Joint Agricultural Commission of the Senate and House of Representatives he stated that $100 thousand in gold in the bank reserves of the Federal Reserve System was equivalent to about $1.8 millions in terms of credit in the country banks of the nation. The $292 millions of "new gold" which was withdrawn from the monetary reserve for industrial consumption during and since the war would have been equivalent to an extension of credit to the country banks of $5.25 billions. Had this gold been available in September, 1920, a less restrictive policy of deflation could have been adopted with safety, which would not have imposed the burden that the agricultural and other industries of our nation have been forced to bear.

I am firmly convinced that if our gold reserve had been protected against this extraordinarily heavy industrial drain and a moderate deflation begun within a year after the Armistice, our present difficulties of depression would not only have been minimized but might never have occurred.

The decline in our governmental revenue receipts is due largely to the falling off in export trade, and yet the gold policy enunciated in your letter and which has been in effect both during and since the war has intensified the difficulties with which the Treasury Department is now confronted.

While the effect of the lessened gold production over this period has been minimized by the jewelers in their testimony before the Committee on Ways and Means of the House of Representatives in their desire to guard their interests from the payment of this infinitesimal tax, an additional credit of $2 billions could have been extended to our country banks, making a total credit which might have been extended by a more conservative gold policy of $7.25 billions. This amount of credit was eliminated through the wasteful practices of our war and

post-war periods. The consequences of this policy have not yet ceased to exist.

Congress realizing the importance of immediate action in controlling the sales of gold to the trades, whenever the protection of our monetary system demands, enacted the law of March 3, 1901, which not only delegates to the Secretary of the Treasury the authority to control these sales but makes it mandatory that sales shall not be made without his consent.

In your communication you refer to the fact that the market for gold is international. There could, therefore, have been no embarrassment to the industrial consumers of gold if they had been forced to purchase their gold in the world's markets instead of having been allowed to remove it directly from the monetary reserve which serves as the basis of our credit and currency.

It is important to note that when the gold reserve ratio of the Federal Reserve System was lowest, interest rates became high and progressed to still higher levels when the policy of the Federal Reserve System to arbitrarily restrict the further extension of credit was put into effect. As soon as the stimulating effect of the additions of newly imported gold to the reserves of the system took place, interest rates became more moderate and the credit tension was considerably lessened, showing what a far-reaching influence under the present banking system of the nation a small amount of gold exerts over the vital instrument of credit.

The benefits of this newly imported gold were immediately reflected in our domestic financial system, but this was accomplished at the expense of curtailing our export trade by reducing the purchasing power of Europe. The same benefits from a like amount of domestically produced gold in the banking system would have resulted without causing this decline in our export trade. The gold which has been diverted from the gold reserve to the manufacture of luxuries, had it been retained in the banking system, would have had a similarly beneficial effect without depressing our export trade.

I note your statement that "it is difficult in these circumstances to see what special equity there is in your claim for a premium when costs are high."

The equity lies in the fact that in the case of the gold mining industry the die was cast, the investment was made, and the loss of this investment occasioned by the shutting down of the

mines was forced upon the industry because of the lack of governmental foresight in promptly providing a means for compensating the loss in purchasing power of the gold ounce, in accordance with the index number. Whereas, the investment in the jewelry industry would not have been impaired in the least by the payment of the excise imposed upon the manufacture of gold articles which could have been readily passed on to the consumer, as provided for in the legislation upon which your opinion has been asked.

The enactment of this legislation will protect the public by insuring the quality of the article sold and would enable the public also to appraise the cost of the workmanship as well as the cost of the raw material. The provisions of the McFadden Bill which were referred to in the resolution impose no penalty on the purchase of foreign gold in this market to be used for non-monetary purposes as the industrial consumers would continue to purchase their gold from the United States Mint at the free gold market price. For this reason a speculative market for gold could not develop.

Furthermore, the cost of the premium provided in this legislation would not have fallen on the general public as a tax burden but would have been borne directly by the consumers of luxuries who have, it is presumed, the ability to pay.

On the other hand, the government sold during this entire period of high prices $292 millions of "new gold" to the industrial consumers at the pre-war price. In effect, is this not subsidizing the jewelers and other industrial consumers?

The objection to employing artificial means to compensate for the lost purchasing power of the gold producers' dollar is answered by recalling that any price fixed by the government is artificial in character.

I note particularly the paragraph in your letter which begins: "The tax which the bill would impose upon the use of gold for non-monetary purposes, while in form a tax, would in fact put restrictions upon the free convertibility of the currency into gold. If gold could not be used except under heavy penalties, for anything else than money, its value would be impaired and there would be, in effect, a clog on the convertibility of the currency. One dollar in paper currency, in other words, would not buy one dollar's worth of gold if the gold was to be used in the arts."

It is difficult for me to understand how such a conclusion could be drawn when the provisions of the bill expressly state that the tax proposed is to be collected only at the time of the sale of the finished product. This tax is, therefore, not imposed upon the bullion to be sold by the mint to the industrial consumers of gold. Under the provisions of this bill the industrial consumers continue to obtain gold from the mint at the monetary price which now prevails. There is no relation now between the sale price of a manufactured article containing gold to the cost of the raw material contained therein. Why, therefore, should the addition of this tax, which would be a small fraction of the sale price of the gold article affect the free flow of gold or its convertibility?

In France, since 1873, a special excise has been imposed upon the sale of manufactured articles containing gold. No disturbance to the free flow of gold or to the French Monetary System has ever resulted. This tax in June, 1920, was greatly increased. No difficulty has been experienced in France in collecting this tax, and there should be no difficulty in collecting the tax here, as it can be readily measured by the amount of gold contained.

Normally $250 millions of the world's total gold production were available for monetary purposes, but during 1919-20 there was less than $60 millions per annum available for monetary purposes, the balance having been absorbed by the industrial arts, India and China.

The production of gold throughout the world is declining, and unrestricted industrial consumption for years to come would be so large as to reduce the amount available for monetary purposes. This condition must be remedied if the gold standard is to survive this period of readjustment. The industrial gold consumption of the world should, therefore, be forcibly curtailed and gold production stimulated. Both of these conditions should be satisfied by an equitable adjustment in the cost and price equation between the producer of new gold and the industrial consumer. The McFadden Bill provides for such an adjustment.

This constructive gold policy put into effect at this time will safeguard the maintenance of the gold standard. Such a policy is also prerequisite to a more rapid revival of our domestic

industry and export trade upon which the full time employment of our people and the prosperity of the nation depends.

In view of the great importance of this subject at the present time and because of its vital, farreaching effects upon all the activities of our national life, I shall await with much interest your answer to this letter.

Very truly yours,
TASKER L. ODDIE.

Hon. Andrew W. Mellon,
Secretary of the Treasury,
Washington, D. C.

At the conclusion of this discussion, Mr. Lawrie then asked permission of the chair to present a statement with reference to the importance of the stabilization of exchange to the maintenance of the gold standard. Permission was granted, and Mr. Lawrie made the following statement:

The Hon. D. R. Crissinger, Comptroller of the Currency, in an address before the New York State Bankers Association in June, called attention to the need for the stabilization of exchange. In the course of the address he made the following statements, which emphasize the necessity for developing a constructive solution of the important problem:

"This has seemed an appropriate time and place to speak of international exchange in its relation to foreign trade. I venture that it never was so important as now, and that the wise and practical solution of its problems would represent one of the longest steps toward the security of human society.

"In a time when international exchange is so vital not only to our foreign trade and to the people throughout the world who have need for our products, we must take the broadest view of the relations among money systems.

"There is not that freedom of commercial interchanges which in normal times is the great equalizer and leveler. The situation demands attention lest the gold standard be gravely impaired, and so I come to bespeak your earnest consideration for the problem. I want you to be sure that in every wise effort to deal with it you will have the fullest support that the national fiscal authorities can give.

"Just when imaginative souls were rushing two generations ago to California and Australia to dig gold, Thomas de Quincy published an essay on California, which solemnly warned that if they kept on digging gold it would presently become degraded in value, useless as a monetary standard, and uninteresting even as an enhancement of milady's charms. De Quincy foresaw the breakdown of the gold standard, pointing out that continued production of gold at the rate then attained could only bring

cataclysm. Yet his fancy never approximated the huge production that was actually attained a few decades later when, Africa, America, Australia, and all the rest were turning out gold in their full flood. He was sure that gold would be debased and demonetized by the first rivulets; yet in fact a deluge was absorbed with no more effect than to establish gold as a well-nigh universal standard.

"Phophecy is a dangerous business. The wisdom of one generation is apt to fall hard afoul the experience of the next. We may well avoid predicting consequences from the unprecedented conditions we see about the world today, but we will be warranted, in studying the experience of other times for whatever illumination it may shed upon the problems of to-day and to-morrow. We will be well advised if we go slowly about scrapping old standards and systems, but on the other hand we will be wise to consider wherein we might well modify, adapt, and modernize the mechanism of credit and exchange."

Since the Comptroller of the Currency called attention to this subject, Mr. McFadden, chairman of your committee, introduced H. R. 8404, on August 24, requesting the President to invite the United Kingdom of Great Britain and Ireland and the Republic of France to participate in a conference with the United States. The bill authorizes the President to appoint three representatives of this Government to conduct a joint investigation of the problem of exchange with three representatives to be appointed by each of the other nations invited. The conference is to convene in the District of Columbia, not later than three months after the issuance of the invitations by the President. The three representatives of this Government are directed to report the results of the investigation and the recommendations of the conference to the Congress for action. And it is further authorized that these recommendations be reported for the individual action of the United Kingdom of Great Britain and Ireland and the French Republic, and such other nations as the conference may designate. An appropriation of $100,000 is to be made available for the compensation of the representatives of the United States, all reasonable expenses, and the proportionate share of this Government of the general expenses of the conference, all subject to the approval of the Secretary of the Treasury.

In commenting upon this bill, Mr. McFadden stated that the rapid and extensive fluctuations of the exchanges of most of the world have exercised a most deterrent influence on the exchange of commodities and world trade, a condition which is a decided handicap to the financial recovery of all nations.

It is not the intention of this bill that disparities of exchange shall be investigated, but that some means should be found, and recommendations made, which would eliminate the hourly fluctuations which give rise to speculations in the exchanges beyond

the requirements of actual trade transactions based upon the transfer of goods and credit. A periodic stabilization of the exchanges should remove, to a large extent, any incentive or necessity for speculation, and it is the opinion of Mr. McFadden that a system of stabilization with a longer periodic change, based upon the ability of nations to increase their gold reserves, reduce their outstanding currency issues, and bring their budgets into balance, would provide a still further incentive for the more rapid return to a normal financial condition, upon which depends resumption of normal trade throughout the world.

Proposals of all nations will be considered by the conference. It is recognized in limiting the conference to the three nations specified that their exchange transactions, in the aggregate, constitute the major volume of all exchange transactions, and that these nations naturally would recommend only such means for stabilizing exchange as would be beneficial, and would meet with the approval of all other countries of the world. On the other hand, the limitation imposed upon the size of the conference should expedite a harmonious solution of this problem and remove a condition of chaos from the economic and financial horizon of the world. As all recommendations formulated by the conference of the nations involved, there are, Mr. McFadden believes, no binding restrictions to hamper a free and open discussion of this subject upon which the economic freedom of the world so greatly depends.

One of the most hopeful indications that the enactment of this bill will meet with approval is to be found in the attitude of our international bankers as reported in the Wall Street Journal two days after the introduction of the bill, as follows:

"There has been considerable discussion recently regarding the proposed conference to be held in Washington, for the purpose of staibilizing the foreign exchanges. A bill has been introduced in Congress authorizing the President to call such a conference.

"Consensus among bankers is that this meeting may be a definite step in the right direction and can, if properly conducted, go a long way toward finding a solution to the exchange difficulties. Bankers unanimously agree that the conference should be attended by the leading international bankers, economists, and level-headed business men and not by politicians.

" 'Confidence and absolute co-operation on the part of all countries participating is needed,' says one banker. 'Confidence in the ability of our debtors to pay, not only the existing debts, but also any further credits that might be extended, is needed,' he said. 'Confidence at the time of making a contract, that exchange will not have depreciated 10 per cent by the time payment is made, is of vital importance to the revival of trade. If trade can be returned to normal, there is no doubt, although the pro-

cess may be a long drawn out one, that the exchanges, with the possible exception of Central Europeans, can be restored to parity.'

" 'In a word,' said the vice-president of the large bank, 'the situation can be cleared up if every country earnestly co-operates. Each country must do all in its power to balance its budget by a strict policy of national economy and taxation, by eliminating all unnecessary expenses and by reducing all necessary expenses to a minimum and finally by arresting the issue of paper currency.' "

Another most hopeful sign of this movement is to be found in the attitude of the London Times, which complains, with reason, that abnormal taxation is swallowing the investment reserve of the individual, admitting also the grievous results produced by the fluctuating values of the pound sterling, and the mark and lays down the fiat that sooner or later international traders must come to some agreement which will stabilize exchanges.

In commenting upon this reference, the Washington Post made the following editorial comment:

"Until in that way or by some other approved method the exchange question is satisfactorily settled, it is hopeless to look for a resumption of international commerce on the magnificent scale or which under the present world conditions a steady money market would be certain to insure. It would seem, therefore, to be a prime duty of statesmen everywhere to devote their earnest attention to the solving of this most practical and yet most baffling problem of modern times."

Henry A. E. Chandler, Ph. D., economist, National Bank of Commerce, in New York, contributed a most comprehensive analysis of the present gold problem to the October issue of Commerce Monthly. In this article Prof. Chandler states that there is little hope of augmenting the European gold reserve from sources of new production. With reference to the possibilities of the future decline in the production of new gold in the world and its increased consumption by the arts and by India, he states as follows:

"However, the war has brought about a new condition in supply. The world's output has been reduced very markedly since 1916, until it is now only about 70 per cent of the prewar output. This reduction is, of course, to be accounted for principally by the increase cost of producing gold as the result of the rise in wages and in the prices of materials entering into operating costs of mines. However, it is the belief of gold experts that even if there should be some further reduction in prices we must face for some time an output considerably below the prewar annual production.

"Other factors which tend to the reduction of the monetary supplies are the increased proportions that may be absorbed by the arts and by India. The future of industrial consumption of

gold is obscured by conflicting factors, including the long-time tendency for the arts to absorb more gold; the question whether large amounts of gold plate turned into monetary gold during the war will in part return to the arts; the stimulation that the present low value of gold gives to industrial consumption; and finally the check to this increased consumption that would result from a falling price level. After considering these factors the net conclusion, however, appears to be that the proportion of annual output absorbed by the arts will remain relatively high.

"India constitutes one of the great uncertain factors in the gold situation. For a number of years before the war she showed an apparent tendency to absorb larger and larger amounts of the world's output. Since the beginning of the war, however, owing to extraordinary conditions, India's annual absorption has been very irregular. While the immediate outlook for India is uncertain, Indian experts believe that she may be capable of absorbing larger amounts of gold. In any case an important reduction in her absorption for a considerable period is not expected. The suggestion that in the near future the vast Indian hoards may be called upon to replenish the monetary supply of the outside world does not stimulate serious consideration in the minds of those familiar with the ways of the East.

"A review of the factors entering into the future additions to the present world supply of monetary gold, therefore, would appear to point to a continued annual output for some time considerably below the prewar output and to an annual net accretion to the world's monetary stock not much in excess of the present subnormal accretions."

Prof. Chandler, in defining our gold policy, concludes his article with the following summary:

"1. In the opinion of the world's experts the present inward movement of gold with the exception of the Russian and Indian flows, will continue for perhaps a considerable period.

"2. The full significance of this inflow becomes clear only when it is considered with respect to the larger gold movement since the beginning of the war.

"3. The larger movement has resulted in bringing to the United States a wholly abnormal proportion of the world's gold supply.

"4. The movement in its entirety has represented a dissipation of a large part of the national reserves of several of the principal European nations.

"5. Notwithstanding numerous proposed substitutes for the gold standard, as well as the expressed belief of European experts that the impending gold shortage renders necessary some means of economizing gold, the fact remains that no substitute, the practicability of which appeals to any considerable number of financial authorities, has been proposed. Moreover, the con-

structive thought of those most concerned in the reestablishment of sound monetary conditions in Europe is clearly in the direction of the gold standard.

"6. While it is impossible to forecast how much gold will be necessary to the return of the European nations to a sound monetary basis, the evidence points to a need considerably in excess of her present stocks.

"7. The question of Europe's need for part of our present supplies of gold does not necessarily wait upon her ultimate recovery or the complete adoption of the gold standard. As fast as one country after another approaches the condition when stabilization of currencies can be considered an increased need for gold may occur.

"8. While it is true that the return of the gold is not imminent and that a considerable period may lapse before Europe can effectively demand any important part of our gold, it is much to the interest of the United States to have these gold reserves returned as soon as Europe can utilize them. With these facts in mind our gold policy should be so formulated that as fast as needed the gold may be returned without causing embarrassment either to Europe or to the United States."

The gold problem is closely related to the stabilization of foreign exchange and the ultimate return of the currencies of foreign countries to parity with gold. A redistribution of gold must be prerequisite to a normal condition of exchange. This redistribution would take place normally upon the development of favorable trade balances, better balanced national budgets, and the contraction of outstanding note issues. Attention is called to these vital matters to suggest that an exchange conference, as provided in H. R. 8404, in the course of investigation may determine some excellent means of gold redistribution which would accelerate exchange stabilization and appreciation to par. This would result in the more rapid restoration of the external purchase power of nations and lead to a general revival of world trade.

In summarizing the economic ills of Europe the October statement of the Mechanics & Metals Bank of New York made the following citations:

"1. The buying power of millions of people, especially in Russia, Germany, and Austria, is severely curtailed or has broken down altogether.

"2. Credit relations are disorganized, and there is no machinery set up for speedy reorganization.

"3. Currencies are debased and in some countries almost worthless, and progress toward restoring the gold standard or establishing any other standard is slow.

"4. Lack of credit and stability of exchanges have paralyzed the whole scheme of international commerce.

"5. Debts and taxes are heavy, and the burden is telling on the people."

In view of the fact that a conference may be called to investigate the possibilities of stabilization, it would, indeed, be premature to outline any specific proposal. On the other hand, it is essential that certain general observations should be made relative to the nature of the problem. In analyzing the present chaotic state of foreign currencies and the possibilities of stabilization, the following items should be emphasized:

1. Exchange experts are of the opinion that from 50 to 75 per cent of the total volume of all exchange transactions have no relation to the actual movement of commodities; or, in other words, are purely speculative.

2. These experts are also of the opinion that the most depreciated currencies are those largely dealt in by speculators because of the opportunity for more profitable return.

3. The speculative transactions in foreign exchange unquestionably have a marked tendency to accentuate the variations in exchange.

4. There also seems to be no question that this speculative attack on the currency of a nation may more than offset any domestic improvement that might occur in its financial condition.

5. It may be reasonably construed from the foregoing that speculation in exchange also has a marked tendency to undermine the financial morale of nations, particularly those whose exchanges are more depreciated, and to a large degree removes the incentive for the improvement of the domestic financial position of such countries.

6. These momentary and violent fluctuations in exchange constitute a risk which must be covered by an additional item in price, penalizing our export trade in competition with other nations.

7. Speculation in exchange is even more far-reaching in its influence and importance than speculation in the sale of a commodity, for exchange is the unit of measure of all commodities, and the international exchange of all commodities is governed by the stability of national currencies and their relation to the gold standard.

8. Violent changes in foreign exchange result in great hardship to exporters when the contract is in importers' currency and to importers when it is in exporters' currency. Cancellation of orders, return of goods, auction sales, etc., follow.

9. Manufacturers of finished products dependent upon imported raw materials suffer from changes in exchange rates as it becomes more difficult for them to predict how the proceeds of their exports will compare with the cost of their raw materials.

10. Exchange fluctuations immensely complicate tariff enactment, as the question of valuation becomes difficult.

11. Labor suffers in so far as exchange in cost of living, as wages do not adjust themselves so rapidly.

The success of the conference for the limitation of armaments will be measured largely by the reductions effected in the military and naval expenditures of every nation. The reductions should materially assist in the better balancing of domestic financial budgets of every nation. A general lightening of the tax burden now being borne by the people of the world should result. The domestic financial position and morale of every nation should improve under such conditions. This improvement should be reflected in a corresponding increase in foreign exchange rates. Under the present chaotic system in which foreign currencies and securities have become the basis for extensive speculation, the benefits from such a conference may be greatly impaired. It would seem eminently fitting and timely that the President, in his desire to attain practical results from the conference for the limitation of armaments, should also be granted the power to call a conference to investigate this important problem with a view to insuring that any benefits derived should not be eventually impaired or lost through the manipulation of foreign exchange. The increased external purchase power of the nations whose exchanges appreciate will be the most certain guaranty of a revival of the world's trade. Under the provisions of H. R. 8404 no date is specified for the conference. The President, therefore, will be free to choose his own time in extending invitations to the countries involved. With this freedom, the President will be better able to allocate the time of the exchange conference to meet the requirements of the international situation.

The need of export trade of this Nation has become a factor of increasingly great importance to the prosperity of the Nation. At the present time the industrial activity of the Nation has become greatly impaired both domestically and externally. In this respect the mining industry, as a fundamental branch of the entire industrial machinery of the Nation, is bearing the most extensive share of the burden. The mining industry is generally dependent upon export trade in order to sustain full-time operation. It is not necessary, therefore, to emphasize the importance of arriving at a proper solution of a problem which so seriously affects copper producers, manufacturers of copper, producers of coal, iron, steel, oil, and other products dependent upon an export market to absorb surplus production.

The Comptroller of the Currency has referred to the fact that the situation demands attention lest the gold standard be gravely impaired. The maintenance of the gold standard is a matter of importance to the entire business and financial interests of the Nation. It may be assumed, however, that the leading nations of the world in control of the monetary gold stock will exercise

a strong influence in removing the chaotic condition in exchange which constitutes a menace to the maintenance of the gold standard.

The problem before the exchange conference would seem to be the elimination of speculation in exchange. Any proposed remedy should also reflect in the exchange rate the improvement or the weakness of the domestic financial position of a nation. It should reflect ability to increase gold reserves, decrease note circulation, balance fiscal budgets, decrease adverse trade balances, and all other sound improvements in financial conditions.

At the conclusion of this statement several questions bearing upon the subject were asked and answered.

Upon the motion of Mr. Sutro, to which no objection was offered, it was agreed that another gold conference be held on the following afternoon, at 2:30 P. M., to discuss the preparation of a resolution to be presented by the gold conference to the Convention.

In concluding the afternoon conference, Mr. H. W. Seaman stated that he had been in Washington frequently during the entire gold campaign and wished to commend the efforts of the American Mining Congress and of H. N. Lawrie, as chief of the Precious Metal's Division, for the work done in behalf of the gold mining industry. Notwithstanding the great difficulties which were thus far encountered in the campaign, Mr. Seaman expressed the belief that in order to maintain the gold standard it was necessary to watch the progress of events and to assist in every way the solution of the exchange problem. Upon the motion of Mr. Sutro, the afternoon session was adjourned until the following afternoon at 2.30.

Second Gold Conference, Congress Hotel, October 19, 1921, 2:30 P. M.

H. N. Lawrie, presiding, suggested a resolution which was fully discussed by those present, and modified in accordance therewith.

Motion was made and carried to present this resolution to the Convention for its consideration. The resolution was so referred, was numbered Resolution No. 1 by the Resolutions Committee, referred to the Convention, and was unanimously adopted.

(Resolution No. 1 appears on page 215).

The work of the Gold Conference having been completed, motion was made and carried to conclude the sessions of the Gold Conference.

Conference on Underground Loading

THURSDAY, OCTOBER 20, 1921

The Conference on Underground Loading was convened in Room 1120 Congress Hotel at 2:30 p. m., Chairman Arthur Thacher, presiding.

MR. THACHER: One of the distinctive things in man is the co-operative spirit with the question of achievement or accomplishment. This question of co-operation in its broadest sense, meaning working together and systematically, coupled with energy, in another phase expresses desire.

Everyone of you were brought up in an environment where there was an urge for accomplishment. But the great bulk of the people are brought up simply to eat and sleep, or indulge in some method of entertainment, and as long as they have these, they have no other desire. This was illustrated during the war when money was plentiful. If we should go out of here and have our salaries doubled, we perhaps would spend the money carelessly, and afterwards wonder why we had thrown it away. We later realize there are things worth striving for, and will then perhaps start to acquire them. Since the war we have had a great deal of mental depression, but as we settle down we will see a tremendous advance.

Take the question of labor, whether for one occupation or another; get a bunch of savages and you will accomplish little or nothing. As they arise in this idea of co-operation and achievement, there is a steady upbuilding that is to become a future factor. We are doing our mining cheaper in Missouri today than we did with sixty-five cent labor.

The question of your shovels and what a man can shovel is a high figure; and what he does shovel is a very different thing. I have seen great accomplishment, even with uneducated foreigners, who could scarcely speak the language.

We are meeting competition in the hand shoveling; we are shoveling today at 10 cents per ton and I believe it can be decreased from that. With men who can shovel fifty to sixty tons per day, you have to have a good machine to equal this. Then you meet with the question of mining problems, and as many of you know we could not successfully carry on all our mining work if we were confined to one or two methods for loading. Let us understand that we have a hard up-hill road and many different problems to face—when you come up against the shoveling, it is a problem. You say you save men, but how many do you save? I do not say for an hour or for six months. A great deal of it is your pioneer work, and even the best of you

who have advanced the farthest have many problems to solve. We will now listen to an address on the "Bureau of Mines Investigations of Underground Loading Devices," by Mr. K. Baumgarten.

MR. BAUMGARTEN, Chairman and Gentlemen: The privilege of addressing you at this conference is appreciated because it affords an opportunity to inform you of what the Bureau of Mines is doing in its investigation of mechanical loading devices.

I would like to take just a moment to review the history of underground loading devices as concerns the present investigation by the Bureau. During the war the acute labor shortage caused Secretary Lane of the Department of Interior and Secretary Wilson of the Department of Labor to organize a committee to investigate mechanical labor-saving devices as applied to mining. On this committee were Mr. Samuel A. Taylor, representing the U. S. Fuel Administration; Mr. Grant Hamilton, representing the Department of Labor, and Mr. George J. Salmon, representing the Department of Interior.

The committee, upon closing its work at the termination of the war, realized that underground loading devices presented a problem that should not be lost sight of, and turned over their files on this subject to the Bureau of Mines, recommending that it be carried forward as part of the Bureau's program.

Thereupon, Mr. George S. Rice, the Chief Mining Engineer, directed Mr. C. L. Colburn to inaugurate a campaign to obtain information regarding various machines and the degree of success obtained by them with the instruction that no opinion should be expressed as to the comparative merits of the machines, limiting any statement to the results that the mining companies gave as a record of the machine's performance. When Mr. Colburn was assigned as Safety Engineer to the Co-operative work engaged in by the Bureau of Mines and the National Safety Council, a report was submitted and that is now in process of publication.

Last April I was assigned to the problem of carrying on this investigation and I am now going to outline the plans under which the investigation has and is being conducted.

Labor conditions have improved so much both as to available supply and efficiency that it has been the experience at some mining camps to find the cost of hand shoveling less than the cost of mechanical shoveling; but in the majority of cases loader operations are today making a material saving over the cost of hand shoveling even under present labor conditions. Furthermore, it has been a matter of common knowledge for many years that there must be an increasing shortage of labor, and, therefore, adequate provision should be made in advance for

a substitute such as is provided by the mechanical shovel of whatever type.

The present investigation is to determine the applicability of the several types of loaders to different mining conditions and to obtain such operating data as well as cost data for a sufficient length of time as to be of real value, so that reliable conclusions can be drawn. The results have not yet assumed a definite trend which would present the operations of the different types of machines so as to guide a mine manager in selecting a proper type of machine suitable to his local conditions.

Manifestly, it will be impracticable to consider every loader installation; but it is planned to secure the co-operation of users of machines of the different types which are operated under representative conditions. The co-operation consists in keeping an accurate record of the indicative data for a period sufficiently long to include all ordinary and extraordinary mechanical and operating conditions.

Exchanging ideas and results of operations under similar conditions necessarily would ensue with mutual benefit to all operators. The performance of any machine in the past must be the guide to improvement in practice in the future.

The mining industry is at such a low ebb that profitable operation depends on low production costs. In the past there has been little co-operation between the mining companies in solving this common problem; the benefit of the experience of the one has not been transmitted to another, and unsuccessful experiments have been repeatedly duplicated for want of knowledge of the former experiments attempted. Therefore, the development of loaders has been a slow, individual achievement.

At best a considerable time elapses before a machine settles down to normal production. The men must be educated to co-operation, must be trained in the use of the loader, especially when a skillful operative is required. The management must be trained to understand the capability and limitations of the machine and must be prepared to adjust the underground methods of production to its use. No matter how flexible individually, the mechanical loader may be, it is perhaps the least flexible part of the whole mining scheme.

A mining company seldom fails to keep accurate cost sheets in details convenient to the management to record the cost per ton. From the accompanying data, analysis may show the tonnage duty of the loader per men employed or per loader shift; if both the hand shoveling and loader costs are recorded in a similar manner, the cost sheet will show the comparative costs, saving or loss of the loader operation over that of hand shoveling, together with the respective duty of each. But no idea is conveyed to the mine manager, or if the records be available to him, to the machine operator, just where changes can be

made in operating conditions or in mechanical details to secure successful or improved operation of the loader. Cost sheets that are only partly accurate are liable to create a wrong impression. The management may be misled by the apparent results, so that it would be more useful to keep no segregated costs whatever, relying upon the totals to reflect any decrease or increase in the costs of the mine operation.

The details of cost sheets as carried into the mechanical loading branch of mining operations have not been sufficient. Cost sheets will measure the duty of a device, but they fail to register the effects or causes of delays, except in the totals columns. The Bureau believes that it is as important that operating records shall be kept to show the time loss due to operating delays, not only inherent to the machine, but also as the result of failure in the mining method or in the underground organization, or to time loss consequent upon failure of defective or worn mechanical and power appliances. It is necessary to record for each loader the causes and effects of delays, so that the management may see at a glance wherein the loader fails and in what particulars the delays occur. By recording the time of each delay a definite idea is gained of the importance of delays and their cause, so as to suggest a remedy. Ordinarily the management is not possessed of this information. The monthly totals of particular delays may be staggering. The longer delays are usually so apparent that the remedy is applied at once; but the smaller details may be overlooked. For instance, at a certain loader operation delays of 4 to 7 per cent of the total time occurred in switching cars, and by relieving the trammer of the duty of hooking up the car trips—leaving that detail to the trip driver—a saving of 2 to 4 per cent resulted, equivalent to 3.5 tons per hour additional tonnage loaded. Again, the delay on account of failure to maintain empty cars at the loader varied up to 18 per cent of the total time; in this case, the delays resulted in a loss of 10 tons per hour of loading capacity, attributable directly to failure to properly co-ordinate the underground organization.

Successful operation is affected by conditions, such as characteristics of the ore, the abrasiveness, size and angularity of fragment, moisture, relative weight or specific gravity. These do not affect hand loading in a large way but become serious factors in the economic operation of the mechanical loader. In a larger way the mining method may facilitate or impede the loader operation. Transportation—the operation of keeping empty cars at the loader and promptly removing the loaded cars—is perhaps the largest single factor in the success of the mechanical loader. Mechanical deficiencies have been gradually overcome by altering the design or materials of parts as seemed to be required, the manufacturers and the operators working

together. New types of machines are continually presenting themselves on the market.

It is, therefore, desirable to point out that the mechanical loader will be a requisite part of mining operations in the future; that the understanding of any loader is best promoted by keeping an accurate record of the operating data, and that mutual benefit will result to both mine manager and to the Bureau in the conduct of its investigation, if the records be kept in a uniform manner so that results can be summarized in a comparative study.

The investigation is conducted with a scope that may not be possible to the individual operator. Its value to the mining industry will depend upon the co-operation of the mine management, who, having installed loading devices, have had experience from which our industry at large can benefit. The Bureau is already receiving the co-operation of a number of mining companies and is arranging with others to record the necessary data. It is purposed then to publish operating and cost data taken in such detail and over a sufficient period of time as to be of practical operating value in suggesting the successful installation of a mechanical loading device.

MR. THACHER: It occurs to me that one of the important things is the gathering of facts. Now, if you are going to get these, you must get the facts that are wanted, and they cannot be condensed into a general cost sheet. We must collect this information in a way it can be utilized.

Then we have co-operation, the real benefits and real advancements come from what we give and not from what we receive.

MR. WHALEY: I have listened with a great deal of interest to the remarks of Mr. Thacher and Mr. Baumgarten and it is interesting to note that the Bureau of Mines is making the investigation they are. The manufacturers of loading machines have a pretty rough road to travel since it is largely a pioneer business. In the first few years especially, he encounters many difficulties and some of the things affecting his success, I think, have been discussed here. I would like to cite a few of the various factors as they suggest themselves to me. The first is the method of co-operation between labor and management or often the lack of co-operation. Even the latent antagonism of the working forces in the mines, to the introduction of an innovation like this labor saving machine will cause failure. This antagonism may not be expressed outwardly and is both hard to locate and overcome.

In the installation where the machine shows absolutely no breakdowns and no delays in the operation of itself at all—that installation may not be successful, due to lack of co-operation on the part of the working forces. On the other hand

where the mining organization takes a lively interest, a great success can be accomplished.

We have various installations; some of the mines say that the machines are not loading any more than by hand, yet they say they are cheaper. On the other hand, where the mine has given co-operation, we have machines that show a great deal of economy. A notable installation I have in mind—in which the superintendent took a very close interest in the shovels—is the Ironton Plant of the Alpha Portland Cement Company. The rock loaded is a white limestone that breaks into fairly large pieces.

The first machine was bought in 1917; the second, two months later and two additional machines have been since purchased. The machines average 350 tons per shift—the management operating three machines and carrying a fourth in reserve.

In the first stages of the development of our machines and all other machines, mechanical difficulties must be met, such as some parts breaking and putting the machine out of business. In the outset we decided on a shovel to load a ton per minute, and when breakages and weaknesses occurred we did not revert to a slower shovel but contended we could certainly improve it, so it would maintain that rate. If we had been discouraged at breakage then, we would have dropped out of the game long since. The fact that we did not drop out of the game, but brought it forward as best we could has enabled us to develop a machine that is in itself a pretty good piece of mechanism and is as reliable as most mechanical appliances.

Applying the same principles to mechanical loading as used by one concern, or half a dozen concerns which make a success at loading, why can't other concerns do so? I feel that the majority of them can. A great many concerns doing mechanical loading have just as good conditions as that concern has, and others can do it by exerting the same amount of intelligence and energy.

MR. THACHER: Mr. Whaley is quite right when he says if you can make a machine load one ton a minute, why is it not possible to make that run eight hours, since that is what the mine operating force strive to obtain.

MR. CORNER: During the last year and a half I have installed about twenty machines, and perhaps I can give you some information regarding their service. In some instances we met with opposition from the managers. When they bought a machine and signed the order you would never see them underground. It seemed that their chief object was to get a low price and a machine that was automatic in everything it did. Hand shoveling had been developed along a contract basis; the vast majority of mines paying so much per ton.

One installation I have in mind was in Indiana; the management down there put some machines in to load coal in entries. In this plant everything had been done on contract basis and the management was trying to overcome the contract system by the installation of machine loading.

MR. THACHER: Day work helps us in our struggle with the very radical unions, in that you can get greater efficiency than you can by piece work. I am still doing piece work, but in just as limited a way as possible. The possibilities that are opening are great, as Mr. Corner indicated. In Illinois 70 cents per ton for shoveling coal is not good shoveling cost—and you and I are paying for it in our living expenses all over the country. I think it is a valuable idea to try and push the mechanical work forward and to recognize these conditions.

MR. SALMON: One of the most important things I see in mechanical loading from an operating standpoint is the keeping of complete data on the operation of each shovel. This would include delays of all types. Unless such data is kept you cannot tell in the event that the shovel has been a failure, whether the trouble was due to the mechanical features of the shovel or whether it was due to the operating organization. If the shovel is a success, your cost sheets at the end of the month may show a profit over hand shoveling, nevertheless carefully gathered operating data will show you where you can increase this profit.

MR. RICE: There is one thing I think needs to be emphasized, relative to the spirit that must be shown by the management and the consideration given in the installation of machines. I am especially aiming at operating from a permanent standpoint. If the management of the mines, when they are considering machines, would consider how they may so change their method of mining to make the best use of the machine. From my own experience in cutting machines in coal mines and watching their development, I believe that the machine loaders can look forward to the same opposition, disappointments and final success.

MR. McCLOUD: With regard to one thought that has been expressed about the matter of co-operation and starting the machine off, it seems to me that in a case of this sort, where it is natural to expect some antagonism, some feeling of distrust or jealousy, or that there is going to be something done that will reduce their wages, you must study the psychology of the problem. Naturally, the union man looks upon this thing with distrust—it is his temperament or disposition.

In most of our industries and lines of conveyance, we have what is called "group insurance," which is given gratis to our men. About a year and a half ago we decided to try a new operation in Kentucky. Our local manager was instructed to

get the men together and tell them what it was—merely an extension of the system we had in other departments of our organization. In connection with giving out the policies, the idea was a man who had been in our employ for six months was to receive $400, and each three additional months an increase of $100. The insurance company requested (and gave out) slips of paper giving the different amounts and especially the beneficiary. About 50% of the men would not sign that statement because they thought that we were trying to put something over. This illustrates the amount of distrust and suspicion you must overcome. Pick out some man for some work, and everything must be explained to him, and you must arouse his interest.

The superintendent must give his co-operation and his mining engineer must also do so. You must know what their problem is, and put every facility at hand to enable them to work out in the easiest and simplest way what is to be done.

MR. THACHER: You cannot blame the mechanical loader if it is put in wrong at the start, no interest shown in it—but you must arouse the interest of your men.

For several years we had candles, then oil lamps and then acetylene. We led them on, and they gradually disposed of the candles, oil lamps and now we have the acetylene lamps.

MR. COLBURN (Bureau of Mines): In the work I have done with the Bureau on the underground loading device, I believe I have looked over papers on perhaps a hundred or more different underground loading schemes. There are some of these machines built and in operation. I believe I have seen about twenty of these in operation. Although the loading device has not been completely developed, it is in an advanced stage. I might state that throughout the country loading devices are being used according to the conditions met with in the mines. We find machines operating on very fine material; we find machines that are handling material that is broken in large chunks. We have machines that are operating in drifts.

We find quite a little development also in the use of scrapers. The scraper has developed into two or three different designs that is being used in the iron mines of the Lake Superior region, consisting of a small scraper operated by one man with a hoist. The hoist will drag the scraper and it will be guided by the second man who stands behind it. These machines are quite handy because they can be set up and taken down quickly. While the machine is idle the men are busy at something else, perhaps timbering, and there is no great investment involved. Then you will find the scraper operated by a 20 h. p. hoist and a rope on the scraper which will pull it back. It is quite heavy and sometimes pulls as much as a ton or more at one load; in some places this scraper is used to pull the material up an

incline and drop it through holes into the car that is located just below.

One of the great elements involved is the time elimination. In many mines they find their cost has not lowered so very much in the loading devices, but they are able to accomplish the same thing in less than half the time. You remember when we first began to use the air drill, we found we could drill by hand just as cheap as air drill, but the air drill was quicker and that is the same thing with the use of underground shovels today. You find places where the men can go in and put in a lot of holes, shoot them and get the material out with one shift. That is a saving of time, and it is essential.

Another thing along these lines is for a coal mine to be able to have a large production; it is necessary to have a large number of working places. The coal must be taken from a great area. If the shovel machine is used, they will be able to obtain the same coal through a less area. Throughout the country there is a great deal of interest in underground loaders. We find some of the operators are going to a great expense and trouble in developing loaders of their own. We find in other places, operators discouraged to a certain extent with the loader, but that is not the rule. As a rule, the operator is interested. I think in a great many instances the operator has not given the manufacturer the encouragement he deserves, when you consider the great amount of cost that these manufacturers go to who build these machines. One manufacturer recently has spent in the neighborhood of one quarter million dollars in underground loader and this money they hope some day to get back in their machines.

MR. RICE: Suppose with the use of modern methods we can get the number of men down who have to be employed in a mine from 400 to 200, to get a rough idea, by means of concentrating the work. Think what a saving it will be in reducing the amount of workings. In big mines where you have 1,000 men underground it is a tremendous feature in getting these men up and down and I believe we should give that matter a great deal of consideration.

MR. WHALEY: In regard to other things that effect the economy of loading machines, besides the actual cost of loading the material in the cars, other matters are overlooked where machines are much of the economy that is effected in the actual operation of mining. To begin with, in a new mine, a loading machine does away with at least half of the men (conservatively). At least half of the men would be engaged in loading material; especially true of coal mines, and we have figured out the cost of houses for the number of men to be employed for loading by hand. In the reduced number of houses, the saving in cost is greater than the initial cost of the machines, and that

installation of the machine will not be greater than for one employing men. That is not applicable to the old mines where they already have their camp, but in the cases of new mines. We have made installations this year in two new mines where the plant contemplates that the less number of men employed will be a saving in houses. When in West Virginia, where a machine was installed even before the railroad was ready to handle the production, this is illustrated. In that work they are now loading by these machines 140 tons of coal per shift in the narrow work where they have to wait on trains and the shifting of cars. The operators of this mine intend to confine it exclusively to mechanical loading. They are now selling their coal cheaper than any mine in that district, although it is a new mine. They find in loading these 140 tons it took the time continually for a period of ten days that the machine is doing in one and a half to three hours. In addition to the saving of cost in investment, there is undoubtedly a saving in the cost of operation.

MR. THACHER: The research chemist or investigator is searching out truths, but he does not know how they are going to be applied. The engineer has not so long to wait, but if he will consider some of these points Mr. Whaley has given us, you can make a saving of time.

The meeting adjourned at 5:00 p. m.

National Conference on Education and Public Service

OPENING SESSION

TUESDAY AFTERNOON, OCTOBER 18th

MR. FULTON: I welcome you on behalf of the Committee on Education and Public Service of the American Mining Congress. The name is an inclusive one, as you will note, and just how it originated I cannot tell you, but the Committee was formed in St. Louis two years ago, and met again last year, in Denver, when an Executive Committee was appointed of which I was made the chairman. The Executive Committee outlined a proposed program, the main feature of which was to be a symposium on mining education. During the past year, the Committee has been in correspondence with many of those interested in mining and metallurgical education requesting them to present papers and discuss pertinent subjects. We are here for that purpose today.

The program for today is to discuss some of the questions, an outline of which was sent to those expected to take part in this conference. One of these questions is that of English in the mining and metallurgical course and as the paper of Professor Nelson of the University of Michigan bears directly on this subject, and he hopes to return to Ann Arbor this evening, we will hear from him first. Professor Nelson represents the Committee on English of the Society for the Promotion of Engineering Education.

(Professor Nelson read his paper: "The Development of a Special English Course for Engineering Students.")

MR. FULTON: Prof. Nelson's paper is on a vital subject. All of us here who have to do with engineering training will concede this. On the whole, students entering technical schools have poorer preparation in English than in former years. Why this is so I have not solved in my own mind, but I believe it can be traced in part to the less severe training the student gets in high school due to the fact that the high school course is so crowded with odds and ends as to curtail fundamental studies. It seems true that men entering the technical schools are less efficiently trained in English than formerly and it is essential for the technical school to correct this deficiency. In what manner this is to be done I do not know. Prof. Nelson has given thoughts on this subject. One of the subjects under discussion is "Should the English taught in technical schools be of a technical character or should it be general in character." I gather from Prof. Nelson's paper that his conception of the

task of the English Department is to make the man acquainted with English literature from the standpoint of the Humanities.

PROF. WALKER (of Kansas): In Kansas we have a separate department of English for the different engineering students doing, in some lines at least so far as our organization permits, the same that Michigan does, and I wish to corroborate what Prof. Nelson has said as to the change in the attitude of these men. I recall 10, 12, or 15 years ago the student looked upon English work more or less as a bore, and I now bear the most enthusiastic comments from them with reference to the work they are doing in advanced composition. Only juniors and some seniors are admitted to that class. We never put a man in that class below the junior year. With reference to the report writing work, we have a Kansas custom of requiring four technical reports prepared by students under the direction of the members of the technical department, and it interests me greatly to know that the English Department of Michigan is taking over that work. Is that required or elected?

PROF. NELSON: That is required and is a two hour course. I lecture one hour a week and have a conference group of about 10 seniors for the other hour. I insist that all the work on the report be done under my direction, which shows how to go about the proposition of organizing technical material when you have that proposition before you and how to get the best result. They do all the work on that report under my direction and the report comes to me first. I cut it all to pieces and insist on rewriting it and putting it in the best form possible. Technical men claim there has been great improvement.

PROF. WALKER: I wish to mention one other thing that Prof. Nelson has spoken of and that is the necessity that the technical teaching staff back up the English Department in holding forth the importance of English training work. I never lose an opportunity of driving that in.

PROF HAYWARD: Our students are all studying engineering and since the founding of the school it has been a policy to require substantial courses in English. Unfortunately the study of English was not always popular and even such an eminent scholar and teacher as the late Prof. Arlo Bates was often annoyed by indifferent or even antagonisitic students. I think that attitude has largely disappeared in recent years. Some of our English staff are among the most popular men on the faculty. They have tried to make English appreciated by the students and if they have not wholly succeeded they have at least made it less disliked. By means of evening readings and other voluntary services some of the instructors have made a secure place in the student life.

PROF. HAYWARD: In addition to the required English

courses of the first two years we require that a certain amount of time in the junior and senior years be given to what we term "general studies." These are selected by the students from a given list of non-technical or so-called "cultural" subjects. Most of these are given by the English department. Among them is report writing in which the student is allowed to select his own subject, often getting advice from a member of his professional department, studying it in the library and then submitting his report to the English department for correction. In this way two ends are served. The student gets technical information along a line in which he is interested and then learns how to express himself in correct English. In spite of continued pressure for more time in professional subjects the faculty has always rigidly stood against obtaining it at the expense of English, history, economics and similar general studies.

PROF. SPERR: The assertion has been made that the high school graduates are not as well trained in English as they should be. Is it not because we are impressed with their lack of training more than we used to be? I rather think it is that we are getting just as good training in high school graduates now as we ever did, but the trouble with the training in English in technical schools is eventually due to the same thing as it is in our high schools—the lack of teachers with the proper personnel and pep in them to get anything into a student at all. When high school students hate the study of English, I think it is largely because of the lack of proper personnel in the teacher. I think if we could in some way get at our normal schools for training the teacher and get at our high school organizations or the directors to impress upon them the necessity of better English teaching in their schools, we could accomplish something. English is made a sort of by-play, a good thing to have, but not necessary. That is the attitude—anybody can teach English. I assume that the object of teaching English is to train the student to use good English in both speaking and writing. The necessity for the use of good English depends on either of these lines and you do not have to confine yourself to technical subjects or think you have to make it either technical or literary, or both. Successful teaching of English to engineering students depends largely on the instructor if he must interest the young men in the subject and make them realize that they need to use good English for their own personal efficiency and success.

MR. FULTON. As chairman I would like permission to make a few remarks on this subject. I think that the high schools are in part responsible for the poor training in English, and still it is not fair to generalize, for I think we will find that in the large cities high schools often give most excellent training in English, but when the country schools and the country high schools are considered we find that there has crept into

the course of study of these schools the vocational training idea, and that this vocational training is largely of a so-called practical nature which takes up so much time, that the really fundamental studies—reading, writing, spelling and arithmetic which used to be taught, rather go by the board, and men come through these high schools with a knowledge of a little agriculture, a little physics, a little chemistry and of 100 other things, the possession of which is really a detriment to them if they pursue further education; for what they did learn of these subjects in many cases must be unlearned and the time that was taken up with them was taken from the highly necessary fundamental subjects. That brings us to this point: Formerly, most of the technical schools had no English in their courses. They had nothing in the nature of the Humanities. My days go back to when technical education in this country was still relatively new and the number of technical schools, particularly the number of the schools of Mines, was not large. I remember that we used to divide the type of technical schools into perhaps two classes; first was the type that my own Alma Mater, namely Columbia University, represented, and second, the type that the Massachusetts Institute of Technology represents. We had instilled into us that the technical school was a scientific school and that while Humanities were highly desirable, the student should have had training in them before he entered the technical institution, or if he did not have, he should pursue the study of the Humanities outside his technical school duties. Hence we had no time for English in the School of Mines. I believe the Massachusetts Institute of Technology has always paid considerable attention to the Humanities. This brings us to a particular question which is a vital one before this conference, namely if Humanities are to be introduced into the course, and we have pressing on us, also many new technical subjects, is the time allotted to a technical education at the present day, sufficient to properly educate a young man for an engineering career? In this connection I wish to present the paper of Prof. Rob. Peele of Columbia University. He requests me to particularly say that in this paper he expresses his personal views, only and not the official views of his institution.

Professor Peele's paper, read by the chairman, follows:

CAN AN EFFICIENT COURSE IN MINING BE GIVEN IN FOUR YEARS?

This question may be considered from two viewpoints: that of the teacher in the mining schools, and that of the employer of young engineers. Both are vitally interested in the establishment of a system of training that shall be good both educationally and professionally. The student's point of view, although he may not realize it before graduation, will usually be found not greatly different from that held by the teacher.

I. It is difficult for anyone who is not a teacher, or who at least has not been a student in a school of mines, fully to understand the pressure for time existing in almost all parts of the schedule of study. Every competent teacher of an engineering subject recognizes the impossibility of covering the ground adequately in the few hours per week at his disposal. It is a truism to say that he must first of all see to it that the students get a thorough grounding in the principles and essential features of the subject. If he fails to insure this, he has failed in his chief function as a teacher. The utmost care is necessary in framing the outline of his subject, to the end that it shall be clear, concise and logical.

But, this is not all. The dry bones of the skeleton must be clothed with flesh and life blood infused. The personality of the teacher is of prime importance in accomplishing this. If he is fully competent, his own convictions will stand out clearly; convictions that are based on knowledge of both theory and practice. The second requisite is a judicious selection of illustrative problems and examples from practice. It is only by a combination of these two elements that the enthusiasm of the students can be aroused and their interest maintained. All of his must be compressed into the brief time allotted to each subject, for lectures, recitations and the accompanying laboratory work.

While the fundamentals of most branches rarely or never change, advances and modifications of practice oblige the teacher frequently to revise his lecture notes. The endeavor to keep abreast of the times leads to careful and anxious examination of the table of contents of each subject, for the purpose of cutting out possible non-essentials. Revision, however, rarely cures the trouble. What the teacher is able to eliminate, is sure to be more than offset by the necessity of bringing to the attention of his class new methods and improvements in old ones.

From time to time, radical relief is sought from localized pressure. A committee of the faculty may be appointed to study the entire curriculum, and to make recommendations that may alleviate the situation. The gist of the committee's report is apt to be that no relief can be found, except by a general "cutting out of details." This, indeed, may sometimes be necessary; for there is always danger of giving undue prominence to descriptions of methods and appliances, the details of which vary as practice changes. But, if the pruning knife be too liberally or unwisely used, in the case of a subject already being presented in a highly condensed manner, the impression on the student's mind is weakened; for details that show the application of theory are aids to mental digestion.

What is the remedy for this pressure for time? To be entirely frank, I think there is no positive remedy that would be generally acceptable. In most cases, the teacher must make the

best of a congested condition, brought about by the multifariousness of our present-day engineering. But, this is not to say that the situation is hopeless, that it may not be ameliorated.

II. The attitude of many employers of young engineers is in some respects like that of purchasers and users of manufactured commodities. They have their ideas as to what the quality of the graduates of the mining schools should be; and, as they are by no means inarticulate, their opinions and criticisms often go direct to the teachers in the schools.

While expression of the employer's viewpoint is always useful, it is of most value when it comes from the manager or superintendent who himself has had the advantages of a technical education. He is then familiar with the schedule of study, and knows from personal experience how hard it is to find time in the brief undergraduate period for an adequate training in the essential preparatory sciences, as well as in the numerous highly specialized technical subjects that now so urgently demand attention. He will then have learned that, under our high-pressure modern conditions, the framing of a sound schedule of study consists largely in selecting what experience indicates as being of most value to young men beginning an engineering career, and that it is no longer possible fully to cover the field.

Some criticisms of the existing courses of study in schools of mines are based on the fact that the young graduate does not always make good in the first year or two of practical life. Inquiry into such cases generally reveals the real difficulty, viz., that the beginner has failed to meet the requirements of the particular position in which he finds himself immediately after leaving the school, because he lacks some special knowledge or aptitude. That such failures occur cannot be denied. The questions then arise: (1) to what extent do these failures constitute a valid ground of complaint against the system of training in the schools; (2) is it possible to give students a sufficient variety of "practical" instruction to enable them, at once after graduation, to meet the employers' demands, in whatever lines of duty they may be called upon to serve?

Leaving out of account the question of the student's personal equation, and recognizing that not all young graduates are fitted by nature for the successful practice of engineering, it is necessary to keep in mind the true aim of a well organized school of mines. It is certainly not to prepare its graduates to perform some specific round of duties, which may form but a very small part of the wide field of mining practice. No course of training could turn out young men, every one of whom would be competent to deal instantly with any and all of the problems that may have to be met by an engineer. Undoubtedly mining students could be prepared for prompt, efficient service in some particular technical position; it is not possible to pre-

pare them to fill immediately and equally well all of the beginners' positions usually open to young graduates. The chief purpose of a technical education is to develop the reasoning powers and stimulate original effort, rather than to afford the student opportunity to collect a mass of engineering data.

In some schools, much time is devoted to certain manual operations of mining. Laboratories have been established to teach students to run machine drills, make comparative tests of drilling speeds of different machines and shapes of bit, sharpen and temper drill bits, etc. One school has a laboratory consisting of a tunnel and power plant, for carrying on actual drilling and blasting, studying the effects of different rounds of holes, and even for practice in tracklaying and timbering. Another has a "mine rescue" and "first-aid" laboratory. All these things are useful, and are good and proper if the school aims to turn out foremen and shift-bosses, or narrow specialists. But the time necessary to attain manual dexterity would better be devoted to the engineering subjects. How to run a drill can be quickly learned, if necessary, in the mine after the graduation, but a sound grounding in mathematics and the natural sciences, and their engineering applications, can never be secured so well as in the school classrooms and laboratories.

A wholly different criticism is that graduates of mining schools are rarely able to handle men successfully. It is often asked why instruction is not given in this important adjunct of all engineering practice. The obvious reply is that ability to manage men cannot be acquired by any course of instruction and study. The subjects of sociology and economics may serve as aids, but experience is essential. This ability comes from a knowledge of human nature, which is generally gained slowly and often painfully—if it be gained at all—in the course of time, and by actual contact with men and working conditions.

Other specific shortcomings, that may be objects of criticism, might be cited. I knew a case where an excellent mechanical engineering department of a mining school was severely taken to task, because one of its graduates, on beginning his field work, did not know how to designate the sizes of iron pipe fittings, for making an inventory. It is probable, also, that, if he had been assigned to the staff of the master mechanic of the mine, he might have found himself unable, at first, to set the valves of a Corliss engine; but, if he had profited by the sound school training given him in the fundamentals of mechanical engineering, he doubtless quickly realized his ability to pick up the thousand and one practical details of his branch of the service, far faster than could be done by his journeymen companions. Similar reflections might be made respecting the routine work of other operating departments of the mines.

III. The conclusion would seem to be clear. A thoroughly

equipped school of mines is not engaged in training its students to be shift-bosses, or mechanics, or electricians. It must first of all see to it that its graduates shall have had a thorough drill in the basic subjects that form the backbone of the engineer's training. In framing a course of study that will accomplish this, the teaching staff is forced to recognize the limitations imposed by existing conditions.

The great breadth of modern engineering practice, the multiplication of methods, appliances and types of machinery utilized in mines, constitute a mass of detail that can be dealt with only briefly in classroom and laboratory. The mining course differs from the relatively homogeneous courses in civil, mechanical, electrical and chemical engineering, in containing a greater variety of subject matter. In each of the latter courses, the technical instruction is in more closely related subjects. Mining engineering, on the other hand, comprises application of parts of all the other branches of engineering, besides the specifically mining and metallurgical subjects. This heterogeneous character of the mining curriculum is largely responsible for the difficulties under consideration. Thirty-five years ago, the case was materially different. Electrical transmission of power was in its infancy, mechanical engineering was far less specialized, and the small variety of mining and ore dressing machinery made the equipment and operation of mines a simpler matter. Hence, the attention of the student was concentrated in a narrower field.

No student of the present day, however able and industrious, can hope to acquire more than a general acquaintance with the great fields of engineering knowledge now applied to mining. He will have accomplished what is practically possible if, after he has completed his preparatory work in mathematics, chemistry, physics, mechanics, properties of materials, geology, mineralogy, etc., he succeeds in familiarizing himself with the salient features of those portions of the allied branches of engineering that furnish so large a part of the professional equipment of the mining engineer. From the standpoint of the school, the great cost of maintaining the group of engineering departments that contribute to the training of mining students, is justified by the efficiency of instruction imparted by specialists in the several branches, and the facilities they afford to earnest students in getting a start in their career. Students are not expected to become encyclopedias, but they can learn how to search for and where to find the data for solving a given problem. This in itself is no small part of an engineering training. They also learn something of which every teacher in a technical school is thoroughly convinced, namely, that no engineering subject can be completely covered by the classroom and laboratory work assigned to it. Even with the aid of conscientious collateral read-

ing, the student can succeed in making only a general survey of each subject. He cannot expect to master any part of it, except by neglecting other parts; but he may hope to attain some familiarity with what may be called the literature of engineering, and a conception of the great fields of engineering knowledge, the extent of which is only faintly realized by those not fortunate enough to have undergone a school training.

To aid the student, numerous pocketbooks and handbooks have been published in recent years, forming a highly condensed library of engineering practice. Their possession, together with a general knowledge of their contents, constitute no small part of the engineer's stock in trade. But they are only the tools of the engineer, the intelligent use of which depends largely upon the school training.

In the usual four-year course, the fundamental sciences cannot be efficiently dealt with in less than say 2½ years, leaving 1½ year (with the vacations) for the technical subjects. It may not be amiss to state that, in mining schools, the word "vacation" does not possess its usual meaning. Out of the 3½ months vacation each year, from 2 to 2½ months are occupied by required field work in surveying, study in mines and ore-dressing plants and field geology.

Realizing that even the ablest student can do no more, after he has been trained in the basic subjects, than to touch the high points of the great range of modern engineering practice, it must be recognized that: (1) no mining school can fit its graduates to perform immediately and successfully the routine duties of all the positions in which they may happen to begin their field careers; (2) even if the pruning knife be freely used in cutting out instruction in technical details, a four-year course no longer suffices for an efficient training in mine engineering.

IV. In recent years, the conviction has been gaining ground amongst teachers in mining schools that, notwithstanding the difficulty of finding time for the numerous technical studies demanding attention, the course should include certain cultural, humanistic subjects; that there is need to widen the student's vision and counteract his tendency to unsymmetrical mental development. Amongst such studies are: English Language and Literature, History and Economics. Here at once is a serious addition to the curriculum and the list is easily lengthened. If important studies are added to the four-year course, it would seem necessary to curtail some of the engineering subjects, or omit them altogether, unless the period of training be extended.

Several schools have attempted to solve the problem by prefixing a "preparatory" year; others by adding a sort of post graduate year. One school has recently adopted a six-year schedule. Its group of engineering schools, including the school of mines, has been placed upon a graduate basis, the length of

the mining course being reduced to three years. Candidates for admission to this shortened course must have had such preliminary general education as can ordinarily be obtained by at least three years' work in a college or scientific school of high rank. The immediate effect of this change is that most of the subjects formerly given in the first year of the four-year course are now included in the entrance requirements of the school of mines.

Time is thus afforded for some of the cultural studies. One of the outstanding purposes is to insure a better training in the use of English, so important to an engineer in his professional intercourse with colleagues and clients. The man who can express his opinions and write reports in lucid language has a great advantage over one who, though perhaps an equally able engineer, habitually speaks and writes in a slovenly, uncultivated manner. The other added studies contribute to a liberal education, that may be expected to prepare graduates for professional practice on a higher plane than is ordinarily attained by those who have devoted four years exclusively to scientific and technical studies.

Whether this expectation will be fully realized, it is not possible to say until the new plan has been longer in operation. It may be objected that comparatively few young men can afford the time and money for so extended a course of study. While such a training has very much to recommend it to those who desire a fuller, more completely rounded education, its ultimate success must depend upon the support of the public having sons to be prepared for the mining engineering profession.

V. Granting, as I think has been shown, that a four-year course in mining is too short, is the plan mentioned above the best that can be devised, or can the objects sought be attained in some better way? Some teachers of mining engineering may question the wisdom of separating the course of instruction into two distinct parts, believing that all of it should be under the jurisdiction of the engineering faculty.

A fairly satisfactory solution of this difficult problem might be found, for most mining schools, by lengthening the period to five years. This would relieve the pressure now so severely felt, while still furnishing opportunity to add to the scientific and engineering studies several of the desirable cultural subjects. But, I believe such a suggestion should carry with it the proviso that the entire course be placed directly under the engineering faculty. This plan has two specific advantages:

(1) It would tend towards better co-ordination of instruction, by insuring undivided responsibility in planning the curriculum and administering the school work. In a course divided between college and technical school, not only may there be "lost motion," but, the members of a college faculty, even with

the best intentions, do not always have full sympathy with the aims of engineering students, nor, perhaps, a sufficiently clear perception of their needs.

(2) It would facilitate changes and readjustments of curriculum, as made necessary from time to time by the development of educational and engineering methods.

Some have thought that the best results would be obtained if the added subjects were taught by members of the engineering faculty, purely from the engineer's standpoint. For example, that the English should not be a broad course in English Language and Literature, but should consist of special instruction in "technical" English. I would not advocate this, any more than I would advocate having the civil and mechanical engineering subjects, that form part of the mining schedule of study, taught by members of the mining faculty. The staff of the school of mines should be responsible for deciding upon the particular cultural subjects to be added, and designating their general scope; but the instruction should be given by specialists in each branch.

As to the substantial benefits that may reasonably be anticipated from a lengthened course there can be no doubt. A better education will be secured than that which results from confining the student's attention too exclusively to the material, technical branches of human knowledge. "Education" connotes something quite different from "training," as ordinarily applied to the preparation for an engineering career. The longer course will afford more opportunity for cultivating the mind and forming habits of observation and sound thinking; all leading to the mental power that renders the truly educated man more widely adaptable and better able to solve whatever problems may be presented to him.

It has not been customary in the past to class mining engineering amongst the learned professions, as of law and medicine. Why should it be permitted to rest under this implied stigma? Together with other branches of engineering, it is in reality a profession, insofar as its practitioners measure up to true professional standards. It deals with one of the great basic industries, supplying a large proportion of the things we use and must have in our daily life. The degree of the development of this industry may almost be considered as an index of civilization. The calling of the mining engineer is a high one, and his education should be on a correspondingly high plane of endeavor and accomplishment.

PROF. WALKER (of Kansas): I want to comment on Prof. Peele's discussion on some of the problems that are confronting us. Some of us feel it very keenly, especially his conclusion as to the length of the course. For over 20 years I have been connected with institutions where a four-year course in mining

has been offered, I have been fortunate, and unfortunate enough during the last ten years to go through the throes of a complete revision of mining engineering, and am now confronted with a similar proposition. I think we should all follow the practice (and the institution I am now connected with still continues that practice) of giving the young man studying engineering choice as to options which he will take—a geological option, mining option or something of that kind. As to the disapproval of that practice, I have found in many cases he had no choice in the matter. A committee has now been appointed to revise the entire mining course. It has advanced in its work sufficiently far so I feel before the end of the year we shall have no options in our four-year course, but we are going to try to do nothing but lay the foundations strongly for mining engineering. We feel, however, as Prof. Peele feels, that four years is not sufficient to give a young man the training he ought to have. In order that we may at least in part adopt the recommendation of Prof. Peele we are going to lay particular emphasis on the fifth year engineering course. We are going to do all we can to induce our young men to take the fifth year. Eventually it may be that we would give no degree at the end of the fourth year. I cannot tell how it is going to work out, but that is what we are going to do. As to Prof. Peele's statement that so many engineering graduates fail to succeed after graduation, it would seem to us that that is largely our fault. It is largely the fault of the engineering colleges. You can take some catalogues, soliciting graduates of engineering colleges and check over their present employment and find they are engaged in lines utterly foreign to those they started out with.

DEAN BUTLER: I agree with Professor Walker that the administrative officers of engineering schools are largely to blame for the fact that a considerable proportion of the graduates engaged after graduation in lines of activity foreign to the course they pursued in college. I have found that a large proportion of our Freshmen have very little idea why they are studying engineering, and especially why they select that particular branch of engineering which they pursue in college. In many cases they have no more reason for so doing than they would have if the choice were based on a throw of dice. They rarely know exactly why they are pursuing a certain course when they come to us, and seem to have chosen their life work more or less at random. It appears to me that it is obligatory upon us to do something to help these young men. We should familiarize them with the qualifications that are required for success in all branches of engineering, and the peculiar qualities demanded in each separate branch. We should endeavor to acquaint them with the nature of the work they will probably be called upon to do immediately after graduation, and the op-

portunities for advancement open to them. We should impress upon them the fact that it is foolish for them to continue in the course that they have selected unless they are sure that they are going to enjoy the work and will be fairly well satisfied with the remuneration they will probably receive. The information given should be as accurate and conservative as it is possible to make it, and the difficulties and drawbacks inherent in each branch of engineering should not be minimized.

At the University of Arizona we have been endeavoring during the past two or three years to acquaint the young men with the facts mentioned through our so-called Freshman Orientation Course which consists of one lecture a week throughout the Freshman year. Attendance is obligatory upon all engineering Freshmen, but no credit is given for the course. After my first lecture this year, in which I emphasized strongly the fundamental qualifications required for success in engineering, five young men expressed a desire to be transferred to other courses. I was mighty glad to have them make the decision then, for our purpose throughout the course is to get rid of the men who should not be there, and to graduate no one who is not perfectly satisfied that he knows exactly what kind of work he is to be called upon to do after graduation, that he is going to enjoy that work, and that he has the fundamental qualifications for success in that work. If the results secured by our course are any criterion of its usefulness, I am sure that the idea deserves the consideration of all engineering administrators.

PROF. WALKER (of New York): Professor Peele states in his paper that the engineering school where a six-year course is now given is a graduate school. I know he did not mean this to read that way. The school he refers to is not a graduate school, as a degree is not one of the requirements for admission. Work which can be obtained in college only is required for admission and this work can be completed in three years, in college, but a candidate is not required to have a degree.

We have been much interested in what Professor Peele says in regard to the mortality of engineers after graduation, meaning that such a large number of men who study mining engineering do not follow that profession. I think that in all our engineering schools a large percentage of the graduates will wander from the mining engineering profession and take up other vocations. This shows that a general mining engineering education is useful as a foundation for almost anything. In the school just mentioned and which is referred to especially by Professor Peele, in his paper, the work is so laid out that a man who has a sufficient amount of interest in mining engineering to complete his course will undoubtedly follow this profession after graduation. That is the case in law and in medicine.

Professor Peele distinctly states that four years is not long

enough. In other words, it does not give sufficient amount of time to properly educate a man to enter the mining engineering profession. The faculties of a number of institutions evidently are of the same opinion as in several of our prominent schools five years' study are required before granting the professional degree, and in two others six years are required. At Columbia University, in New York, they decided a few years ago to institute a course which would require six years' study after a man left the preparatory school before he could receive his professional degree. This course was framed with the idea of giving the man a thorough training in the fundamentals of engineering, mathematics, chemistry and physics prior to entering the engineering school, it being arranged so that this work could be completed in three years. He then enters the professional school and devotes three years to strictly engineering subjects at the end of which period he receives his degree.

If this man takes his preliminary work in Columbia college, then enters the engineering school and spends one year there he will receive his bachelor's degree, having up to that time received what in other institutions is called a "strictly scientific education," of a high standard. He may leave then and enter the engineering profession or take up something else in which he will find this education to be of valuable assistance. If, however, the man continues through six years and receives his engineering degree he will be very thoroughly prepared in all fundamentals and, as far as is possible, in strictly engineering subjects. He will have had more time to absorb engineering instruction and is more likely to continue on in the profession.

I am very glad to have had a chance to say a few words about our aims at Columbia as I know that the present program in the School of Mines has been rather severely criticised. While some of the details of this plan may have to be changed as time goes on we believe that the experiment is well worth while.

MR. GREENSFELDER (of Hercules Power Co.): I am attending these meetings to find out if possible how we as manufacturers can better co-operate with educational institutions in educating engineering students on the subject of explosives and their uses. We feel that possibly there is not sufficient time in the curriculum for the regular instructors to devote their time to that, but we are willing to co-operate in whatever way we can to provide this information. Last summer I was traveling to deliver lectures at various colleges, and I found considerable interest among the students, particularly when they listened to a man who was connected with a company manufacturing the particular product they used. One of the professors wrote me afterward that they showed greater interest because a man coming from a company who was making the product lectured to

them, than if the information had been imparted by their regular instructor.

We want to know just how we can further this idea. We would be willing to get up publications and pamphlets particularly designed for students at engineering colleges. We encourage members of our company to contribute articles to publications issued by engineering schools—in other words, our desire is to disseminate all the information we can to students, and I want this conference to know we are open for suggestions along this line.

MR. FULTON: Mr. Greenfelder represents the Hercules Powder Co. which takes the product of the technical school. Sometimes, as Prof. Peele said in his paper, there is a difference of opinion between those who teach and those who take the product of the teaching and I believe, to express myself frankly from out of my own experience, that the usual view of the company that takes the product is somewhat narrow and applied to their own particular field. For example, in a large industrial city where I was formerly connected with a prominent technical school, we asked for suggestions from the manufacturers in different fields as to what we should teach, in order to prepare men for their work in engineering. The response almost invariably was that we should train the men for the respondent's own particular businesss. Of course when you hear this reply from one man it sounds very reasonable but when you collect the data of the hundred replies you at once perceive how utterly impossible it is to base an education on these concrete replies. We most heartily welcome what Mr. Greenfelder has offered us, but the question remains after all "Who is the best man for the industries?" Is it the man who is specifically trained and must complete his technical education by serving an apprenticeship. Some of the great mining and metallurgical companies have apprentice schools. They are willing to take a technical graduate and keep him a year or two to learn their particular business. I think this method a sound one.

PROF. MOORE: I think there is a different viewpoint to be taken, depending somewhat upon the nature of the institution with which you are connected. In the state institutions we get a little different type of student from those in the privately endowed institutions. I found, for example, that the men who come to our institution are in many cases poor men financially, and they find it very difficult to finance four years in college, and yet some of these men are excellent men and it would be a mistake for all of us to adopt a six year course. I believe the University of Pittsburgh has recently adopted a five year course in mining which will go into effect next year. I think it is a question of the greatest good to the greatest number and our object in education should be to educate as great a number as pos-

sible to as high a level as is practical. In fact we have to strike a happy medium until such time as we can get men educated so the mining men as a whole will be in a position to send their sons to college. For that reason I think it will be essential for us to stick to a four year course for some time to come.

I think also a great deal depends on the instructor. Some put men through four years who never make a failure. Other instructors will keep a man for seven or eight years and never enthuse him with the subject at all. One thing I endeavor to impress upon our faculty is to put a student in the same place in college as if he were out in the industry—getting work out of a man and getting things done is what counts. I think after all the essentials in an engineer are not necessarily more than an average ability but application of knowledge, and if you can get him to apply himself he will be successful.

Now as to vocational guidance, I am convinced there is not a great deal to it. I do not believe there is any one man, a Dean of Men, for example, who knows everything, and can advise students on any type of course. Men have come to us who know nothing about mining, yet after they have gone through the course, have been very successful. It is essential that you should give a man an opportunity to see a mine or a steel plant and see if he is willing to stick around one when he gets out. If he is going to be happier in Liberal Arts, by all means let him go through that course, but remembering this, it is a whole lot easier for an engineer to take up another line of business than for a man who has gone through Liberal Arts work to go out and take up an engineering profession. We can steer a great many of our men into certain phases of the industry, not strictly engineering, but requiring an engineering course as a foundation. I am inclined to think that in this day specializing is practically necessary to separate in the upper year or two courses in mining and metallurgy in order that students may get some of the later developments in such fields as metallography.

MR. GREENSFELDER: One of our directors made the statement that in his opinion our salesmen should be 75% efficient as service men. Where a sale involved an actual demonstration, the salesman is of greater value to the company if he is able to handle the service work himself. I do not know that I can answer Dr. Fulton's question about just what a manufacturer would recommend to educators in training engineering students. That is something that would have to be given considerable thought. An engineering knowledge will be of immense advantage to a man in following the commercial end of the business with a manufacturer of technical products. If I were hiring salesmen for our work I would prefer mining engineers as I think they would be more versatile and better suited for the service part of our work. We want to encourage

students to take an interest in explosives and the proper method of using them.

DEAN BUTLER: I believe that most of my staff agree that it is unwise of us to demand of all engineering students that they pursue a course of more than four years' duration. We are all convinced that we must lay a very thorough groundwork in the fundamental sciences, and that beyond that our function is to train the student to think, and to show him how to use the knowledge that he has acquired and which has been made available through the work of others. Apparatus and methods in vogue now are apt to be out of date by the time the student has graduated, and it is largely a waste of time to place much emphasis on such matters, especially details. A great deal of information has been printed and is readily available along almost any specialized line that the student may be called upon to follow after graduation, and he should be taught how to find and use this data, and encouraged to depend upon his own efforts to secure a working, detailed knowledge of any technical subject.

We have practically decided at the University of Arizona to eliminate all options during our four-year undergraduate course leading to the degree of Bachelor of Science in Mining Engineering, and to offer no opportunity for specialization until after the Bachelor's degree has been secured. We have reached this decision because we find that only a comparatively small percentage of our graduates follow the particular line of work (mining engineering, metallurgy, or geology) in which they specialize during their senior year, and we have also learned that it is difficult or impossible to give sufficiently thorough training in the fundamental subjects in four years if we permit our students to specialize in any way. I believe that next year we shall follow the plan mentioned, and shall offer a fifth year which, if successfully completed, will lead to the degree of Engineer of Mines, Metallurgical Engineer, or Mining Geologist. We may also decide to offer a fifth year course in Mine Administration which will lead to a suitable degree. While it will thus be possible for our students to secure a degree in four years, especially promising men will be urged to take a fifth year either immediately after finishing the four year course, or, preferably, after they have been out of college for a year or two.

PROF. HAYWARD: I agree with nearly everything Professor Peele has said except his conclusion. I wish, however, to comment on his criticism of laboratory work. I agree with him that if we merely make the student go through a lot of mechanical operations the time is wasted. The purpose of the laboratory, and I refer especially to a metallurgical laboratory, is to make clear the theory we teach in the classroom. With the small apparatus it is necessary to use it is of course impossible to teach practice, but we have demonstrated again and again that

if a student does not get the laboratory work he is very likely to lose much that is valuable in the classroom. Our laboratory time is cut to a minimum. We stop when we think we have illustrated the theory. For instance, in running our laboratory blast furnace the campaign lasts sixteen hours, the class working in four shifts of four hours each. The men move from position to position and during a shift each weighs and feeds a few charges, taps the furnace, etc., and takes necessary observations for a complete thermal balance of the furnace, viz., gas analyses, and temperatures, cooling water temperature and volume, blast temperature, volume, pressure, and humidity, slag temperature, etc. The day after the run all products are weighed and sampled. The necessary analyses and calculations are made by an assistant and each student is furnished with a complete account of stock and thermal balance which are discussed in detail at a conference session of the class. During the campaign about five tons of charge are smelted and our experience has proved that the time and money are well spent.

I should like to give some laboratory experience which proved unsatisfactory and tell how I remedied it. Two years ago in a readjustment of the course in Metallurgy some additional time was made available for laboratory work. This was to be principally in copper leaching and I laid out a series of tests on sulphatizing and chloridizing some copper ore, leaching it hot and cold with various acid strengths. After the work was completed the results of the entire class were plotted and curves drawn to show the extractions under different conditions. At the last session of the term I took the figures and tried to show briefly their application in calculating commercial costs, plant capacities, etc. During the term, although the men had faithfully done the work assigned, there was no evidence of enthusiasm and very little interest. I took occasion to mention this to one of the more thoughtful members of the class and asked him what the trouble was. He told me frankly that most of the men didn't see what it was all about until the last exercise when the figures were applied. Accepting this as a just criticism I made a radical change last year. There were twenty men in the class. Four captains were chosen by the students themselves and these leaders divided the class into four groups of five. To each group I gave a separate problem of roasting and leaching and left them to divide the operations of roasting and leaching. The results obtained were to be used in calculating a plant to treat 1,000 tons per day and make estimates on operating costs, finally calculating what copper must sell for to make the plant pay under the conditions determined. I gave them suggestions and pointed out methods of attack, but they went far beyond my requirements or expectations. They wrote for catalogues, interviewed their engineering friends and sought information from

every available source. Of course numerous assumptions were necessary and doubtless many of the estimates were wide of the mark, but in the end four highly creditable reports were passed in and man after man told me that he had enjoyed it more and obtained more good from it than anything he had done in his course. Every man had put in hours beyond the allotted time not because he had to but because he wanted to and I don't think one complained or expressed regret.

This experience demonstrated to me more than ever that one of our primary functions as teachers is to implant a real thirst for knowledge in the student. If we do this the student will educate himself with only a little guidance on our part. If we can't stimulate a student's interest, no amount of effort or spoon feeding will enable us to turn out an engineer that is good for very much.

Professor Peele's conclusion was that more than four years is now necessary in a mining school. With this I disagree. There are a few cases, of course, where a man knows just what he is to do and needs special preparation for it, but on the whole it does not seem desirable. First, with careful planning it is possible to teach the fundamentals of mining or metallurgy in four years. Beyond a certain point we get to details of practice which can be better learned in the plants. Second, if the student has acquired an enthusiasm for his profession he will not cease his study after graduation, and two years after he receives his degree he will be better educated than if he remained at school. He will also be farther along in his profession. If the student hasn't become enthusiastic for his profession he is better off in practice even if he doesn't study than he would be in school. Third, the item of expense must be considered. Many have hard work financing themselves for four years. A longer time would be prohibitive.

Let us provide graduate courses for the few men who need them but keep the regular course at four years.

I am inclined to think that we could do much to stimulate study after graduation by increasing the practice of offering engineering degrees to be given after two or more years in practice to graduates who present satisfactory evidence of study and research.

PROF. SPERR: I remember a little experience I had in talking with a gentleman. I asked him "As a graduate yourself, as a teacher of mining engineering, a mine manager and an employer of much technical labor as well as other kinds of labor, I wish you would tell me that you think an undergraduate mining engineering student should be taught." He said "to think," and I believe he hit everything that is really worth while. Yes, I believe a four-year course is long enough. Three years is long enough if you make it intense enough. We think we can

put out pretty good men in three years by working them the year around and doing it intensively.

I have a great deal of respect for what Prof. Peele has given us, and what he says is true, but after all we have got to cut it off somewhere and the question of where we must cut off outside of fundamentals perhaps will have to be settled by the conditions each school is working under and what it tries to do. The objects of the different schools may be divided rather roughly into two clases: One, to make what we call professional engineers, reporters on mining properties. etc. The other is primarily to make mine operators and managers. With us we think more largely of this latter object, and most of our men follow that line. We all agree in that the fundamentals must precede everything else and all we can do in any special line is to help the student to assimilate the fundamentals. If we do that we will do well. We cannot make them finished practitioners in any line you can mention. We can make them useful for a certain kind of work which gives them an entrance into some capacity or other and then it is up to their own individuality and the forces in them whether or not they will be successful.

MR. FULTON: It is well to sum up some of the thoughts that have been expressed. How are we going to achieve the results of vitally interesting the student so that when he leaves he will possess the fundamentals and enough of technical knowledge to begin his career with? The question of a four-year or a six-year course for a mining or metallurgical education is a fundamental one. Why do we wish more time now than we did ten, fifteen, or twenty years ago? I think the answer is plain. The amount of professional knowledge has increased greatly since that time. Twenty years ago a mining engineer was also a metallurgist. Then a graduate in mining engineering might find a berth in a steel plant and very soon adapt himself perfectly to the work in hand. Now all this is changed and the technical knowledge that has accumulated makes for a sharp division between mining and metallurgy. How specialized technical knowledge relating to meallurgical operations is may be illustrated by the existence of an active technical society known as the Electrical Engineers of Iron and Steel Plants. These men are engaged in electrical engineering solely in relation with iron and steel works and of necessity must possess some general knowledge of the metallurgy of iron and steel, it is now, I believe, impossible to educate a man, sav in mining, and then have him successfully follow metallurgy. There is a demand for men who are thoroughly and specifically trained in either the mining branch or the metallurgical branch of the mineral industry.

I believe it incompatible with modern industry to give the student a general course only and then graduate him expecting him to find his place. He must be specifically trained in a cer-

tain direction. The question is: Will it take longer to do this now than formerly? Is four years enough or does it now require six years? Will we expect to make it eight years a decade hence? Solving the difficulty by lengthening the time is, I believe, the easiest way which is not necessarily the best way. The difficulty is fundamental and I believe cannot be solved by an addition of time. It really rests in the psychology of the student. In general the young man between 18 and 23 in the technical school or the university has usually only a hazy idea of what he is eventually going to do. I have a low opinion of the practicability of vocational guidance. In nearly all cases, the direction in education that a young man takes is at the suggestion of his parents or interested friends and is not his own free choice. There are, of course, some men mature enough to make a free choice but the majority are not of this type. Broadly I believe it is undesirable to attempt to direct a man vocationally. In most cases those who find themselves out of place in the technical school will seek an adjustment. It is also true that the man educated in engineering has such a generally useful education that he can readily enter business or almost any industry and succeed. The student is in college or technical school at a critical age, physically. I believe it is more difficult for a young man to concentrate on work in hand between the ages of 18 and 23 than at any other time in life. His chief interest during this period is in the opposite sex and it needs discipline and admonition, constantly applied to keep him at work. This rests in the nature of things and needs no further discussion except that it is one of the things, though wellknown, frequently ignored. At 23 the man's viewpoint radically changes and he is desirous to begin work. Moreover, he is not content to work just to be educated but he wishes to do things in his profession, his objective becomes definite. I have always felt that in engineering the fundamental conception of the profession and the orientation of the individual are obtained only in the works and in the field. In this respect it differs from the professions of medicine and the law, as for example in modern medical education the student is in close touch in the latter years of his course with practitioners through the clinics and the hospitals. The engineer deals with labor and recently the demand is voiced to instruct the student in what has been termed "human engineering." But can this be taught in schools? Fundamental conceptions can be conveyed in courses of economics and sociology but the real understanding and practice can be gained only in the works. I believe, therefore, that four years in the technical school are enough to teach the man the fundamental sciences and to direct him technically in a basic way in the particular field he expects to follow. His orientation and the instruction in the technique of his profession is well left to what may be called his appren-

tice course in the mine or works. I have the highest regard and veneration for the Humanities and a man's life would, indeed, be passed in gloom and darkness were it not lighted by what is so beautiful in science, art and literature. But with the exception of English Literature, the great field of the Humanities can only be indicated to the student and reliance must be placed on his initiative and curiosity to explore this region that will yield him such full treasure for the enjoyment of life.

PROF. WALKER (of New York): We all undoubtedly believe that specialization in several subjects is impossible. We have a certain amount of ground to cover and a comparatively short time to cover it in. As a result it is impossible to instruct students very thoroughly in more than one branch of engineering. In designing a course for a mining engineering student we must necessarily include work in electrical, mechanical, and civil engineering, but we cannot attempt to make electrical, mechanical or civil engineers out of these men.

It requires considerable work to keep our courses of instruction abreast of the times and while our Chairman has had a much longer experience in teaching than I have had, in spite of the fact that he was graduated from the Columbia School of Mines a number of years after I was, I cannot agree with him in the statement that there is but little more to teach now than at the time either of us was in school. Many subjects not even thought of then must receive a great deal of attention now.

While I believe fully that the instruction in the fundamentals should be thorough I also believe that we must have time to give proper instruction in engineering subjects afterwards in order that thoroughly trained engineers may be produced. For your information I would like to state that in the School of Mines at Columbia, the students may select either mining engineering, mining geology or metallurgical engineering and specialize in one of these three branches during the last two years of their course.

SECOND SESSION

Wednesday Afternoon, October 19.

MR. FULTON: We will open the second afternoon of our conference with remarks by President O'Harra of the South Dakota School of Mines. He began yesterday to say something to us about what he thought should be in the mining course. When Dr. O'Harra concludes, it will be desirable to plan for a continuation of our organization for next year, and I wish to state briefly that the matter presents itself to me in this way: The American Institute of Mining Engineers has claims on this conference. I understand that when Mr. C. H. Mathewson was requested to address this conference on metallurgical education he said that the subject of mining education belonged to the American Institute of Mining and Metallurgical Engineers. That, of course, is a matter open to discussion. It would appear that we might be submerged in the Institute as its activities are so large and varied. I doubt whether under its auspices we could come together as closely as we do here. The title of this organization is "Committee on Education and Public Service" and as stated yesterday this is a very comprehensive one. In this organization I believe the mining schools and the mining and metallurgical departments of the Universities throughout the country may very well get together and meet for the discussion of their problems. I think it is unnecessary for this organization to set a very high aim, such as an all around reform in technical education; meetings for discussion and exchange of ideas will be ample motive. Miners and metallurgists and geologists have always held together the world over, and the field, while a large one is not so large as to preclude organization into one group. If we lay the foundation for such an organization at this meeting, and include the mine inspectors and the state geologists and divide the group into two divisions—first: those having to do with mining education and second: those having to do with public service, I believe we will have something well worth while. This can be done under the auspices of the American Mining Congress. The Society for the Promotion of Engineering Education might perhaps be considered as the proper place for the educational division but this society has been in existence so long and no one has taken any particular interest in getting the men interested in mining and metallurgical education together, so that the Mining Congress seems to afford the better home. I now call on Dr. O'Harra.

DR. O'HARRA: Mr. Chairman and Gentlemen: Dr. Fulton has just informed me that my name is on the program but I was not aware of the fact and I do not know just where I shall

begin this afternoon. It occurs to me that it is clear to all of us, and particularly after what was said yesterday afternoon, that we have two unreconcilable things to deal with. We have a limited amount to do and an unlimited number of subjects. Now it seems to me like the thing for us to do is to recognize those things freely and fully and try to adapt ourselves to the situation. We cannot forever be teaching one individual these subjects and we cannot forever be trying to get into a course everything that is legitimately allowed in it. I have every evidence that we should group our thoughts first around the 4 year course. I think after that is definitely done and we have worked out the problem in the best way we can, we should try to work out something in the way of a 5th year, and then as I intimated yesterday I think some institution ought to work out something in a definite detailed way or something more extensive than that. In connection with mining work, we are not so much interested in that, but we do feel there is an opportunity for some institution to develop that particular feature.

Now in regard to what should be in the 4 year course. We say all of us that there ought to be proper attention based on fundamentals, but no two men will agree as to what all the fundamentals are and how much of the fundamentals should go in. I believe that more or less of the students when they come to a technical school do not have a thorough grounding in mathematics. A man must have enough mathematics to do engineering work. It certainly is fundamental, and the question arises right there, "How much mathematics do they require?" We will find differences of opinion right there. I talked with a man who has had a long experience in metallurgy just a few days ago and he said "I never use algebra." Some metallurgists would think he was crazy if he would say that. Now the question arises whether or not it is an absolute necessity for every man to have a good thorough grounding in calculus, and it seems to be a real question. Mathematicians would say it is not a question. Every mining engineer and metallurgical engineer should have a thorough grounding in calculus.

I believe we can have real good mining men and perhaps more especially real good metallurical men without too much calculus. A man must have some work in chemistry—how much chemistry he has depends perhaps on whether he is in mining work or metallurgical work. He should have the rudiments of chemistry, but the man who is going in for metallurgy should have all the chemistry he can get. I say that with a good deal of seriousness. He cannot get too much, but you can try to give him too much in 4 years' time. A man must have physics—I suppose we might say "The more the better," but we have to stop somewhere. You have to give him such an amount of physics as will best fit in with the series of subjects you are going to give.

Perhaps it would not be out of the way to say that my particular work is geology. In our particular school for a considerable number of years we gave 4 years work in that subject. In our freshman year we gave General Geology; in our Sophomore year we gave Mineralogy; in our Junior year we gave Metamorphic Geology and in our senior year we gave Economic Geology. I had the course arranged that way, particularly I suppose, because I was a geologist and because my coworkers agreed to let it go in, but we felt that something else must be done and I was led to the belief that it is largely a game of "Give and Take" and so at the present time in our own institution we are giving General Geology in the freshman year; Mineralogy in the sophomore year and Economic Geology in the senior year. I may say we have added a 5th year, which is not compulsory but gives an advanced engineering degree. In that 5th year we have the work which was formerly given in the junior year—Metamorphic Geology—which is perhaps the hardest. It is taught in a very complete way and the 5th year students are better able to handle that subject.

In a recent revision of our course we have rearranged our English work to some extent. We give two years of English work—the first and second years. The sophomore year is largely on the nature of engineering or scientific subjects and is arranged to be taught in such a way as will bring out the intrinsic value of the subjects.

We have also introduced, and in fact have work in economics and sociology. In connection with this we have recently introduced work in connection with the business essentials of engineering. That is usually given in the senior year. We feel that time seems to show that the engineer has not in the past had enough business training. It is not bookkeeping or simple commercial calculation, but it rather pertains to the business that the manager of an organization has to deal with. Now in an indirect way we have no special provision for it, but we try to give a student some sort of training in the looking up of literature. In our own work in years gone by we have felt that so many of our seniors grow up without information enough about how to go about hunting the literature they want in their after work.

Now I think that at the South Dakota School of Mines we have solved the difficulty so far as the 4 year course is concerned. We require all of our students—mining and metallurgical engineers—to take mathematics through calculus. We give them calculus 5 hours the first semester and 4 hours the second semester. I think that is going as well as we could hope for in a 4 year course. We require physics, one full year of physics, and it is a good stiff course. We require 3 years of chemistry and most of our students take what practically amounts to 4

years. The two most difficult things we have had to contend with are these: how to give the student some work in modern languages. Particularly French and Spanish, and how to give him some work in some subjects more particularly related to the sciences we teach.

Personally I think, and I think very seriously in regard to this, that schools generally over the country today (not all of them) have not awakened to the opportunities that there are for teaching some of the most fundamental things in connection with our biological course. I think if there is to be any division of the mining or metallurgical course that some real good hard honest study should be made as to whether or not it might be possible to introduce some phase of biology in the engineering course. You may think that strange and that so far as the engineering work is concerned the engineer has no particular use for anything real closely connected with biology. We discussed yesterday the cultural needs of any man going through educational institutions. I think that one of the most helpful cultural courses that can be devised is certain phases of geology or certain phases of biology. When I was in college I took 5½ years of Latin, 3½ years of Greek, the same amount of German, some French, some Anglo Saxon, and about all the English I could get—more than the catalog required—and more mathematics than required. My friends, I mention what I have had because I do not want you to think I have had some of these other things. Some of the finest opportunities for cultural work are in some of these things we pay so little attention to. If we cannot get those things into a course let's teach some of these things without having them in a course. I just want to drop a thought in regard to that. If we do not teach some of the things that are not in the curriculum we are going to miss a wonderfully good chance and I am afraid we are not recognizing our absolute duty. In my judgment no engineer, mining or metallurgical, should go out from an educational institution unless he knows something of the fundamental things of life, whether it be biology or sociology, or something else. He must know something else. He must know some of these things, and you cannot put all of these things into your course, but get some of them in. After all one wants to use his ingenuity to get success. I do not know that I have anything else to say on the subject of the 4 year course. In my judgment the 4 year course is all right, but I am partial to the 5th year course. I will say, following what I have already said in regard to the 4 year course, the 4 year course is not enough but it is as much as some men can take, but there is a good opportunity for the 5th year course. We have introduced it; other schools have introduced it, and it is something well worth developing. Now then if we are going to have a 6th year let's build around the

6th year and make the work correspond with the 6th year course, but when we get up to the 6th year course let's not forget the good things open in the 5th year and the good opportunities in the 4th year.

MR. FULTON: I believe Dr. O'Harra struck a key-note in his address; when he dwells on the importance of the sciences, particularly of the natural sciences in our higher education. He has expressed the scientist's view of education. Herbert Spencer and Thomas Huxley expressed fundamental ideas on this subject and I firmly believe that the day is coming when most educators will view education from this standpoint. Certainly it is true that no educated man should go forth from a university or school today without some fundamental knowledge of the biological sciences. I distinctly remember zoology and botany in my college course but these subjects have disappeared as unnecessary for the engineer.

I agree with Dr. O'Harra when he states that if subjects are to be added to the engineering course they should be of this type rather than the extension of our purely technical subjects. These are the subjects which are pressing for entrance, can we take the responsibility as educators of engineers and let our men go out without a fundamental knowledge of such subjects as economics, biology, and sociology. There is a tendency in some of the technical schools to make instruction more and more practical so called. I believe this tendency a great mistake resulting in not much more than a trade school education. I believe that the acceptance of the sciences as cultural subjects and the recognition of the great possibilities of biologic sciences and psychology in ameliorating human life will come rapidly within the next 5 or 10 years, and those of us engaged in education should be prepared to aid in the change.

PROF. SPERR: In regard to the many interesting questions under the Symposium on Mining Education which was sent out by our Chairman, Dr. Fulton, in preparation for this Conference, I would say that it would seem to me well to discuss all of these questions exhaustively if we were allowed sufficient time. I have made a few notes on some of the questions as follows:

1. What is the scope and content of a modern course in Mining or Metallurgy?

Upon the answer to this question there can be no precise agreement among educators. The following outline is suggested as a basis for discussion. The number of hours is given as the total time to be devoted to the subject by the student.

WEDNESDAY AFTERNOON, OCTOBER 19th

	Hours
Mathematics as far as the calculus	600
Physics—Mechanics, Heat, Light, Magnetism and Electricity	300
Chemistry—Theoretical, Qualitative, and Quantitative including Assaying	900
Geology and Mineralogy	500
Lettering and Drawing	350
Language	250
Wood and Iron Working—Shops	400
Surveying—Field and Mine	750
Materials and Mechanics	800
Hydraulics	150
Electricity	200
Economics, Industrial Accounting and Management	250
Mining Operations, or Metallurgical Operations	600
Plant Design—Either Mining or Metallurgical	200
Total number of hours definitely specified	6,200
Specialized work in any one or more of the above subjects as may seem desirable, including calculus if desired	1,000
Total number of hours of undergraduate work	7,200

2. Can the cooperative system in Engineering as practiced by the University of Cincinnati be successfully applied in a Mining or Metallurgical education?

Yes, where the surrounding conditions are favorable; and no, where they are unfavorable. At the University of Cincinnati they justly emphasize the importance to the student of learning labor conditions. Many of our students work more or less in the mines, mills and smelters during their college career. Such work is not required for graduation and no credit is given for it towards a degree. For many years we have had the question of requiring such work under consideration. Under our present system the student who works in the mine finds his job like any other laborer and is taken into the confidence of his fellow workmen in a way which would not be open to him if he were placed in his position under the other system, and we think this gives him the greatest possible advantage for learning the laborer. We advise our students to work in the mines to learn mining and, above all, to learn miners and to learn them sympathetically—in other words, to study the human element. The good driver loves his horse, and the good superintendent loves his men. Good superintendents, good bosses, are born, improved by proper training, but not made to order. We are not yet convinced that we should adopt the other system.

3. What is the best way to make room in a mining or metallurgical course for the constantly increasing number of technical subjects which apparently should be included?

No doubt there is yet much room in most of these courses as

actually given for the introduction of new technical matter for illustrative purposes, even in the teaching of the so-called fundamentals. When everything possible has been thus provided for, old matter will have to give way for the new whenever the new is shown to be the more important.

4. What are the basic elements of a mining and metallurgical course? Answer, mathematics, physics and chemistry.

5. Should the mining and metallurgical course be recast and rebuilt and if so on what basis? Answer, yes, constantly, and on the basis of improvement for greater efficiency.

6. Are four years enough for a course in mining or metallurgy, taking into consideration all elements that enter into this problem? This question was quite thoroughly discussed in our conference the other day.

7. How is the subject best taught? Answer, by requiring the reading of certain selected lessons and the solving of definitely assigned problems. The aid of models is helpful, visiting mines is essential, work in laboratories is important, and work in mines is desirable.

8. How is the subject of metallurgy best taught? Answer, in very much the same way as the subject of mining, except that metallurgical and milling plants and subjects are to be substituted for mines and mining subjects.

9. How much mathematics should there be in the mining course? In the metallurgical course? See outline under the first question.

10. What is the best way of teaching English to Engineering students? Answer, first by arousing their interest, showing them the value of being able to handle the language properly and efficiently as one of the necessary means of accomplishment: second by requiring the students to speak and write for the teacher's commendation and criticism. The speaking may be in class or in conference discussions and recitations. The writing may be on topics of the students own choosing.

11. Should the English for engineering students be technical and limited in character or broad and include literature? Answer, the use of good English depends on neither.

DEAN BUTLER: I think as scientists or engineers we are apt to believe that uniformity of systems is very desirable. I know we feel that way in regard to much of our work, and I used to have the same idea relative to engineering courses; but I am not so sure now that it is desirable for us to work toward absolute uniformity in mining engineering courses. I realize that it would be impossible to achieve that end even if we did attempt to do so, for I have never found two Deans of Mining Schools who could agree on all the particulars of a curriculum.

There are, in fact, many reasons why it is not desirable that all mining curricula should be identical. In every institution we have one or more instructors who are exceptionally good teachers—men who can enthuse their students, who can make them work wonderfully well, and who perhaps mix into their courses some of these other things that we have mentioned and which are not in the curriculum. Such men will naturally find it easy to gain a little extra time for their work, and will do so at the expense of other instructors, who, while they may be good, are in no way exceptional. Then, also, the needs and opportunities of the students in different mining schools very considerably—some, for instance, are mostly interested in coal mining, while others feel little or no need to study this subject at all; some of you are in regions where iron and steel mining, ore dressing, and metallurgy, are especially important, while others of us see no reason to emphasize these subjects. It seems to me that the object of discussions of this kind is not to attain uniformity, but merely to ascertain what other people are doing and thinking, and to discuss these questions in the hope that we may be given ideas useful to us in our work. I believe, however, that it is possible and desirable to reach agreement as to how much of the fundamental sciences of mathematics, physics, chemistry, and geology we should demand, and, roughly, what the material covered in these subjects should be. I hope that in subsequent meetings a part of our time, at least, will be given to a consideration of these subjects, and that eventually we shall find ourselves in accord on such matters.

MR. FULTON: One of the interesting questions before us is that of mathematics and which was touched on by both Dr. O'Harra and Prof. Sperr. Prof. Thompson of Idaho will give us a few remarks on the subject.

PROF. THOMPSON: I want to thank Dr. Fulton for saying "a few remarks" as that saves me from making an explanation why I have not a formal paper. First of all with regard to this question of uniformity, some of you may remember a year ago seeing a diagram which I had at the meeting. I do not think there is any danger as to uniformity. We are not in any very serious situation in respect to that. This does not represent all of the schools but most of the schools. I am sorry to find friend Butler's school omitted. We leave out Columbia because they are on a different plan or basis, but this is the ordinary 4 year course. You will note a variation in the subjects as given, mining and metallurgical engineering, geology, chemistry, physics, mathematics, economics, surveying, drawing, etc. Evidently there is a long way from uniformity in those things, and I am inclined to think we will probably just as well stay away from uniformity. Strong men will emphasize their work. It is highly desirable that the students should have advantage of it. If

you have a weak man naturally his work will be minimized. Notice the variation in mathematics. There is a good deal of variation from a minimum of perhaps 5% to a maximum of about 10%. What we tried to do was to take the catalogs and work from those. By careful work we managed to try to get things down to a fairly uniform basis of comparison.

Now especially with respect to the question of mathematics, I imagine I am probably on the opposite side of the question from most of you. Personally I think if we are to endeavor to let mathematics stand upon the mental disciplinarian ground, it cannot stand there very long. Its position in that field is exactly the position Latin or Greek occupied 30 or 40 years ago. I do not think that position can be held very much longer. I think there are a good many teachers of the older school, particularly teachers of mathematics, who cling to that idea that if one only had a strong mathematical line he could master anything, but most of us I think have come to the conclusion that the average teacher of mathematics can teach mathematics and nothing else on God's green earth. As to its cultural value I would like to have someone enunciate just what is "cultural education." Mathematics has never been listed as among the fine arts of life and I do not think it can stand very long on the basis of its value in conversation of pink teas or anything of that kind we now come to the question of its utilitarian value. The answer to the utilitarian value is to be furnished by the examination of the literature of the profession.

So much for the application of mathematics in the work of the profession. Nevertheless I believe in spite of all that that we ought to have a good big lot of mathematical training in the mining engineering course. I believe, however, that it will have to rest entirely upon the utilitarian basis on the ground that there is just as much training in the study of a thing which is useful as in the study of a thing that is useless. I believe that our mathematics have got to rest fundamentally upon the utilitarian basis, and I believe that our mathematics should be taught with its practical application constantly in mind, not a narrow limited practical application of the thing, but with a view of its use. I believe there is a great deal of material in the average traditional course in mathematics which has no relation on Heaven or earth with that which the engineer has to deal and which could be excluded from the course with very great profit.

MR. FULTON: You have heard Prof. Thompson's remarks on mathematics. I recall we had a paper last year by Prof. Peele on this subject. There was considerable discussion at the time. I believe that the question of mathematics is dual. First, mathematics we might say it a cultural subject or a subject which is in the course for the purpose of developing the reason-

ing power, and second it is a utilitarian subject, and furnishes one of the tools of the profession. I know from personal experience in teaching that students who have gone through this long training in mathematics come to a subject in which mathematics might be used and then lamentably fail to do so. There seems to be no connection in their minds with the subject in hand and their training in mathematics. I cite a metallurgical example. There is a problem in alloys in which we desire to caluculate the amounts of the several constituents which are present. The calculation is one of proportion. You give the students this problem and usually at the first, not more than one in 40 or 50 can solve it and arrive at the correct answer. There seems to be no connection in the student's mind between the principles of mathematics which apply to the problem and the problem itself. I have noted this in detail year after year to discover whether I perhaps was hasty in my judgment but it invariably comes out the same way. The student is studying alloys and hence a problem in metallurgy, but in reality it is not a problem in metallurgy but a simple problem in mathematics. The connection is not established in the mind—not even with the best of men. Now, naturally this is not true only of alloys or metallurgy but of all other courses in which mathematics is used. From the standpoint of utilitarian value in a course of mining or metallurgical engineering, I think mathematics is more or less of a failure, so far. There is another point concerning mathematics. Those of us who have the "mathematical mind" (some of us have, some have not) know that the mathematician must be precise and specific in his start of a mathematical theorem. But in purely mining and metallurgical problems, in order to complete mathematical formula, one must assume certain things. One cannot carry out the calculations without doing that and of course the result of a mathematical calculation which is based on an assumption is either correct or incorrect, as the assumption is. There is no question but what the civil engineer, the mechanical engineer, and the electrical engineer deal with mathematics in quite a different way and what I have said does not apply to them. As regards the mind training obtained by mathematics, I am frank to say that I used to be a believer of the old school, but doubts are now creeping into my mind. There are so many men who go through mathematics in a mechanical way. One can learn mathematics in a mechanical way. If you do not comprehend the problem you go to someone for help—that help is rendered you and the helper does the real mathematical thinking while you follow the routine calculation. The mathematics in the case is done for you. By such means men get through their mathematics some way. But how much mathematics they know at the end of the course is a question and I do not hesitate to say that the utilitarian value of the mathematics acquired in this way is but small. Mathe-

matics to a certain extent are essential in the study of physics and chemistry—just how much is necessary I do not know but I am beginning to doubt the educational value of mathematics carried too far and it is an open question as to whether some of it might not be eliminated and replaced by other things.

PROF. SPERR: I am radical on that subject. It is not the fault of the student but it is the fault of the teacher if beneficial results are not attained from the study of mathematics. Mathematics is both utilitarian and beneficial for mental development if properly taught. It develops the analytical capacity of the brain, and I do not think any of you will contend that the mining engineer requires no analytical capacity. He needs to know how to take the known quantities and from those known quantities to find the value of the unknown, analytically.

PROF. WALKER (of New York): My object in coming to this meeting was more to learn the opinions of others than to express an opinion myself. I find that I have expressed one or two opinions already, and, on the subject of mathematics, would like to say another word. In our six-year course we devote a considerable amount of time to mathematics, some may think too much. Our work in this subject is so arranged, however, that while the students are taking the calculus they are applying the principles of calculus in their work in mechanics and physics, so as the men are taught their mathematics they are instructed how this training can be utilized. In other words, we consider mathematics not simply a training for the student's mind but a subject which can be utilized in his daily work.

It would seem to me impossible to leave the calculus out of a well designed engineering course, as otherwise how is a man to thoroughly understand his mechanics, physics, or resistance of materials. In teaching students who have gone through this fundamental training I find that they are apt to use mathematics on all occasions. In fact, the use they make of higher mathematics in problem papers is sometimes embarrassing. In arranging for the course in mathematics it is well to have the teachers on this subject confer freely with the teachers in the departments of physics, mechanics, and engineering so that the best results, from an engineering standpoint, can be obtained.

PROF. THOMPSON: In the first place I want to set myself quite right with Prof. Walker and this meeting. I would not be willing at all to sacrifice the calculus. We agree there, but my point is I believe that all of our mathematicians should be given a more definite understanding in the direction of its application than is now given, and I think we can agree on that and then if in doing that there remains any opportunity for a comparison it should be done. Then as to the other thing, Professor Walker of Kansas has had some first-hand experience apparently with Professor Moore's method, but his conclusions are not the conclusions which I gather from what I can learn from the

application of things at Washington. It may have been a makeshift method as applied in the army. I think everything we did in the army was of necessity makeshift or we would not have gotten anywhere.

PROF. HAYWARD: Along the lines of Prof. Thompson's remarks, I recently was in conversation with one of our instructors in applied mechanics. I was making the complaint which I frequently make, that calculus is a splendid thing but very few students know how to use it. He agreed and went on record with this statement that one full term amounting to about 60 hours of our applied mechanics could be saved if we taught that in connection with calculus. His idea was to teach the calculus and at the same time teach the applied mechanics—that was his opinion but I do not know how general that is.

PROF. WALKER (of Kansas): I do not mean to condemn the method of Prof. Moore as not having any value in itself, but my point is I cannot conceive how we could really replace a complete course in the mathematical subject.

MR. FULTON: I doubt if there is as much difference of opinion among those discussing this question as there seems to be. I feel sure that neither Prof. Thompson nor myself would like to do away with mathematics but it is evident that many courses in the engineering curiculum have had a serious revision in the last 15 or 20 years. The chemistry is totally different from what it used to be; the physics different; but mathematics is on the same basis as it has always been. Why this is I do not know but perhaps this is one reason for it; in engineering schools, as in the universities, mathematics is not taught by engineers. It is taught by men who have different viewpoints of mathematics than engineers. If mathematics in schools of applied science be taught by engineering instructors we would probably obtain a different result from the utilitarian standpoint. Take the whole field of mathematics in education—starting in the grammar school where the student begins with arithmetic and then goes on to algebra, and then passes on to the high school where he again takes algebra and then geometry and from there to the technical school or university continuing the series, and certainly the facts are evidence that most of those who go through have received no direct benefit from a utilitarian standpoint within the range of the higher mathematics. This is a fact I think we must face. Prof. Walker said his students bring him problems worked out by mathematics and he wonders why they used so much mathematics in working out that particular problem. I believe that mathematics is an indispensable tool for the engineer, but our system often fails to furnish a good tool, in place of high speed steel it is made of malleable iron.

PROF. THOMPSON: I think, on another subject altogether, that it would be well for us to spend a little time in considering a little bit of the business side of this organization. The organization I think started at St. Louis two years ago, and I think we call it the Committee on Education and Public Service. Since the organization of that Committee it develops that while there is a certain kinship of interest between the State Geological Surveys and Mining Schools their interests are some different. On the other hand there are some unfortunate individuals who happen to be hooked on to both sides of that organization and who would be interested in the discussion of both phases of the work as outlined. I think it might be a good plan for us to continue this title of "American Mining Congress" and have a Section A of the Schools of Mines and a Section B of the State Geological Surveys and Bureaus, and try to arrange for meetings of both.

I understand the Institute of Mining Engineers rather feels that this conference belongs to them. After all the American Mining Congress in the old meaning of the word has been the Alma Mater of this little organization and whether it would be wise to "tear the baby away from its mother's breast" at this juncture or not I am not at all sure. In any event I think this is the 3rd year I have attended these meetings and they have been very profitable to me. I believe we should have some opportunity and some occasion to get together as often as once a year if possible. I believe it would be well for us to leave it to the Institution and the Congress to settle just where this child belongs. We do not care particularly about that but by all means do not kill the baby.

I think in order to save time it might be well to have a nominating committee to discuss the situation a little further. I would, therefore, move that you appoint a nominating committee.

Nominations are in order.

PROF. WALKER: I nominate Dr. Chas. H. Fulton as Chairman of this body.

MR. FULTON: I highly appreciate the nomination, but I feel that my time this coming year will be so occupied that I can scarcely do justice by accepting the chairmanship again. There is much correspondence and work in connection with such an office, and I believe the Chairmanship should pass around amongst the different institutions. For this reason I must decline the honor. I feel gratified that I should be asked to serve again, but under the circumstances it will hardly be possible for me to do it.

On a motion of Professor Arthur Walker, Mr. Fulton was requested to withdraw his declination and he will again serve as chairman for the coming year.

JOINT SESSION COAL AND METAL MINING BRANCHES—STANDARDIZATION DIVISION

MONDAY, OCTOBER 17, 1921—11:00 A. M.

CHAIRMEN

COL. WARREN R. ROBERTS

Chairman of the General Committee of the Coal Mining Branch

and

MR. CHARLES A. MITKE

Chairman of the General Committee of the Metal Mining Branch

The Second National Standardization Conference, held in connection with the Twenty-fourth Annual Convention of The American Mining Congress, was called to order Monday, October 17, 1921, at eleven a. m., at the Hotel Congress, Chicago, Colonel Warren R. Roberts, presiding.

CHAIRMAN ROBERTS: I am going to give you a brief outline of the work of the Standardization Division during the past year.

The forenoon session for to-day is to be a joint conference of the Metal Mining Branch and the Coal Mining Branch of the Standardization Division. At this session the Chairmen of your General Committees will outline to the Conference briefly our plans for the work of the various sessions and also to review briefly the work accomplished by the two Branches during the past year.

We are greatly disappointed that Mr. Chas. A. Mitke, Chairman of the General Committee of the Metal Mining Branch and who has been on an extended trip to South America, has not yet returned. Mr. Mitke not only organized the work for the Metal Mining Branch but has directed this work through his various Committees during the past year. Mr. Mitke is an authority on Standardization and was not only interested in the subject but was writing extensively and trying to promote it long before many of us had learned to appreciate the importance of Standardization to the industries of our country. However, he has appointed Mr. McGrath, one of his colleagues, who will report to you briefly on the work of the Metal Mining Branch during the past year and who will have charge of the sessions of this Branch and present to the Conference any reports which this Branch may have completed ready for our approval.

Separate sessions will be held of the Metal Mining and Coal Mining Branches. Our object in arranging for separate sessions was to enable each Branch, before presenting any reports to the General Conference, to review such reports carefully and as far as possible harmonize these reports and thus save time for the General Conference.

SPECIAL JOINT COMMITTEE

We recommend to the Conference the appointment of a Special Committee of, say, two members from each Branch of the Division to re-

view reports presented by the Committees of the two Branches and take under consideration the following suggestions.

By reviewing these reports critically, this Special Committee will likely discover that certain conclusions have been reached and recommendations made by certain committees in the two Branches handling corresponding classifications of work which it will be necessary to harmonize and on which this Special Committee should report back to the Conference making recommendations.

METHOD OF PROCEDURE

Another question which it might be well for this Special Committee to take under consideration relates to the "Method of Procedure." After this Conference have completed their work on any particular classification or schedule and have in turn received from The American Mining Congress its approval of such standards—how shall we then proceed to place these standards below the Mining Industry and secure the adoption of these standards.

A method of procedure was suggested by Mr. Callbreath, Secretary of The American Mining Congress, in his "Introduction" in our first "Standardization Bulletin." This method of procedure suggested by Mr. Callbreath met with the approval of some of the Committees of the Coal Mining Branch and immediately on the issuing of this "Bulletin" the Chairman of such Committees proceeded along the lines suggested by Mr. Callbreath. Other Committees, however, have not followed this method and I think it would be well for us to decide this question finally at this Conference so as to have a uniform method of procedure.

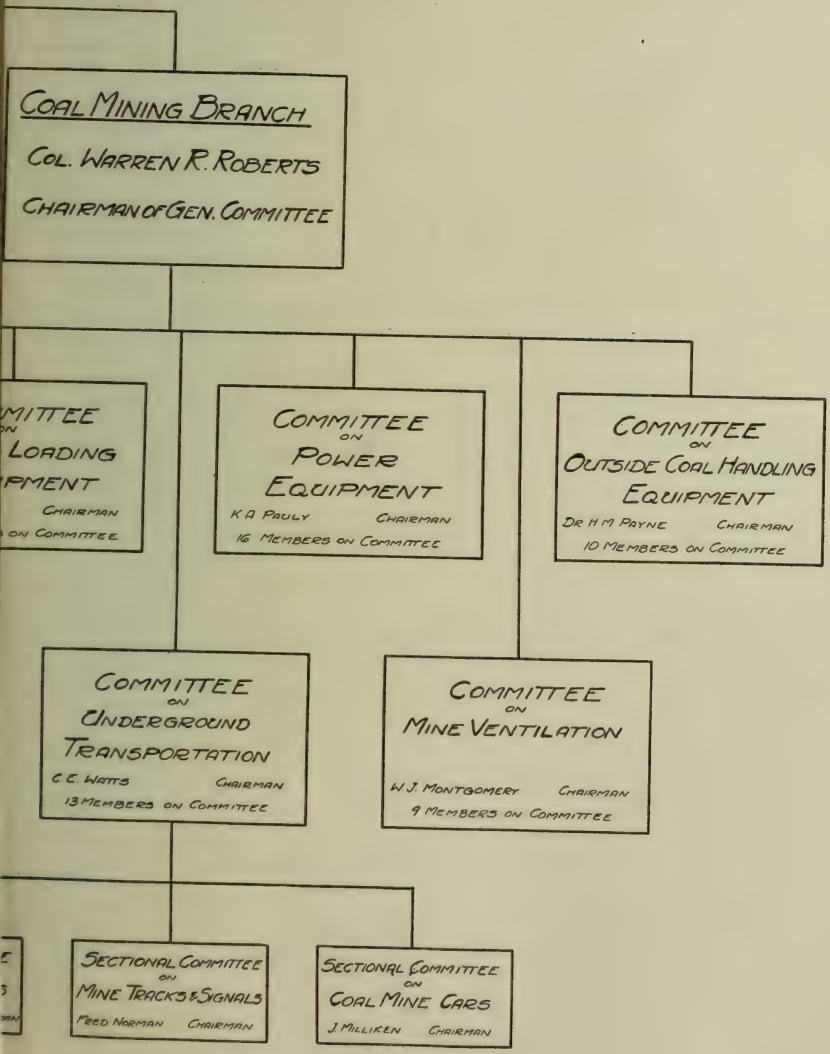
OUTLINE OF WORK FOR SPECIAL JOINT COMMITTEE

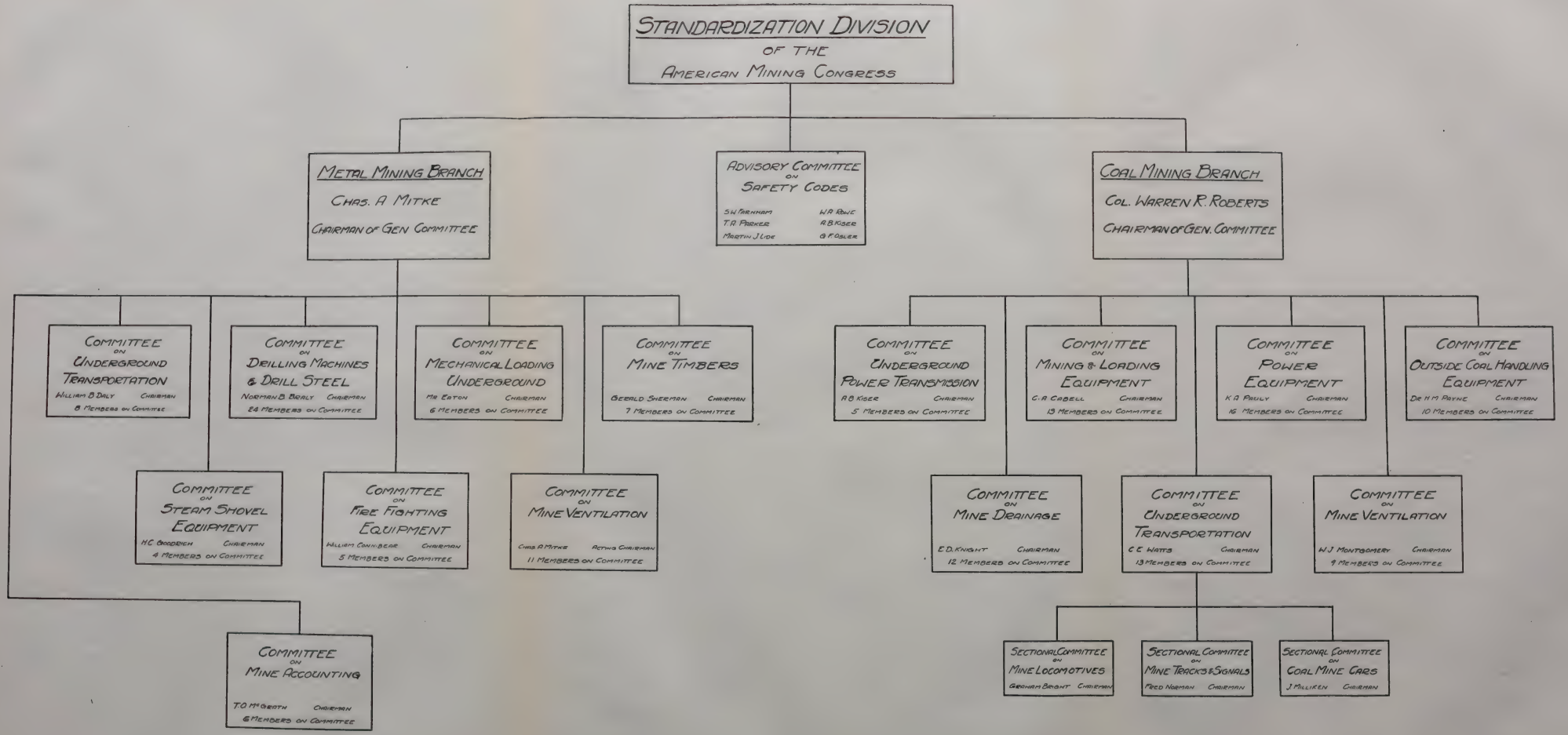
This Special Committee should also consider carefully suggestions which have been made in the past by the members of certain committees of each Branch that the work of such Committees in the two Branches might be handled more advantageously by combining these Committees which are now working separately for the two Branches. We had considered these suggestions when made and had not acted on the suggestions for the reason that at that time the work of the Committees, especially in the Metal Mining Branch, was not sufficiently developed to enable us to decide whether the practices in the Metal Mining on such classification of work was sufficiently identical with the practices in Coal Mining to enable such Committees to combine their work to advantage. We hope that the work of the various Committees is now sufficiently developed that it would enable a Special Committee to decide this question and make recommendation to the Conference. It is a very important matter and should have our most careful consideration. We believe this is a proper time for sufficient discussion of this question to enable us to decide the advisability of appointing such a Special Committee and will delay the further presentation of our report to allow for such discussion.

ORGANIZATION CHART

As preparatory to that discussion, I have prepared an organization chart of the Standardization Division of The American Mining Congress, so as to visualize the organizations doing the work for you. First we have the Metal Mining Branch, Mr. Mitke, Chairman. Then we have the Coal Mining Branch, of which I am the Chairman. Then we have an Advisory Committee on Safety Codes that is connected, of course, with both Branches.

Now let's consider the organization of these two Branches, which, up to date, have been carried on separately, each and every committee of each Branch carrying on their own individual work; and then we will consider the combining of certain committees.


COAL MINING BRANCH
COL. WARREN R. ROBERTS
CHAIRMAN OF GEN. COMMITTEE
MITTEE
ON
LOADING
PMENT
CHAIRMAN
ON COMMITTEE
COMMITTEE
ON
POWER
EQUIPMENT
K A PAULY CHAIRMAN
16 MEMBERS ON COMMITTEE
COMMITTEE
ON
OUTSIDE COAL HANDLING
EQUIPMENT
DR H M PAYNE CHAIRMAN
10 MEMBERS ON COMMITTEE
COMMITTEE
ON
UNDERGROUND
TRANSPORTATION
C E. WATTS CHAIRMAN
13 MEMBERS ON COMMITTEE
COMMITTEE
ON
MINE VENTILATION
W J. MONTGOMERY CHAIRMAN
9 MEMBERS ON COMMITTEE
SECTIONAL COMMITTEE
ON
MINE TRACKS & SIGNALS
FRED NORMAN CHAIRMAN
SECTIONAL COMMITTEE
ON
COAL MINE CARS
J. MILLIKEN CHAIRMAN


STANDARDIZATION DIVISION
OF THE
AMERICAN MINING CONGRESS
METAL MINING BRANCH
CHAS. A MITKE
CHAIRMAN OF GEN COMMITTEE
ADVISORY COMMITTEE ON SAFETY CODES
S.H. FARNHAM
W.R. ROWE
T.R. PARKER
A.B. KISER
MARTIN J. LODE
G.F. OSLER
COAL MINING BRANCH
COL. WARREN R. ROBERTS
CHAIRMAN OF GEN. COMMITTEE
COMMITTEE ON UNDERGROUND TRANSPORTATION
WILLIAM B. DALY CHAIRMAN
8 MEMBERS ON COMMITTEE
COMMITTEE ON DRILLING MACHINES & DRILL STEEL
NORMAN B. BRALY CHAIRMAN
24 MEMBERS ON COMMITTEE
COMMITTEE ON MECHANICAL LOADING UNDERGROUND
MR EATON CHAIRMAN
6 MEMBERS ON COMMITTEE
COMMITTEE ON MINE TIMBERS
GERALD SHERMAN CHAIRMAN
7 MEMBERS ON COMMITTEE
COMMITTEE ON UNDERGROUND POWER TRANSMISSION
A.B. KISER CHAIRMAN
5 MEMBERS ON COMMITTEE
COMMITTEE ON MINING & LOADING EQUIPMENT
C.A. CABELL CHAIRMAN
13 MEMBERS ON COMMITTEE
COMMITTEE ON POWER EQUIPMENT
K.A. PAULY CHAIRMAN
16 MEMBERS ON COMMITTEE
COMMITTEE ON OUTSIDE COAL HANDLING EQUIPMENT
DR H.M. PAYNE CHAIRMAN
10 MEMBERS ON COMMITTEE
COMMITTEE ON STEAM SHOVEL EQUIPMENT
H.C. GOODRICH CHAIRMAN
4 MEMBERS ON COMMITTEE
COMMITTEE ON FIRE FIGHTING EQUIPMENT
WILLIAM CONNIBERE CHAIRMAN
5 MEMBERS ON COMMITTEE
COMMITTEE ON MINE VENTILATION
CHAS. A. MITKE ACTING CHAIRMAN
11 MEMBERS ON COMMITTEE
COMMITTEE ON MINE DRAINAGE
E.D. KNIGHT CHAIRMAN
12 MEMBERS ON COMMITTEE
COMMITTEE ON UNDERGROUND TRANSPORTATION
C.E. WATTS CHAIRMAN
13 MEMBERS ON COMMITTEE
COMMITTEE ON MINE VENTILATION
W.J. MONTGOMERY CHAIRMAN
9 MEMBERS ON COMMITTEE
COMMITTEE ON MINE ACCOUNTING
T.O. MCGROTH CHAIRMAN
6 MEMBERS ON COMMITTEE
SECTIONAL COMMITTEE ON MINE LOCOMOTIVES
GRAHAM BRIGHT CHAIRMAN
SECTIONAL COMMITTEE ON MINE TRACKS & SIGNALS
FRED NORMAN CHAIRMAN
SECTIONAL COMMITTEE ON COAL MINE CARS
J. MILLIKEN CHAIRMAN

There are certain committees in the Metal Mining Branch of which we have no corresponding committees as yet. For instance, they have one on Fire Fighting Equipment. We have formed no such Committee. They have a Committee on Mine Timbers; we have no corresponding Committee. We have no Committee on Drilling Machines and Drill Steel; and no corresponding Committee for their Committee on Steam Shovel Equipment. But these Committees which we have with the same titles appear identical and may be combined. That is for us to consider. There are three Committees that are common to both branches —Underground Transportation, Mine Ventilation, and Mechanical Loading Underground (we call our Committee, the Committee on Mining and Loading Equipment). It has been suggested, especially as regards the Committees on Mine Ventilation, that they be combined. Some men have said, "Well, mine ventilation is mine ventilation. There is no reason why any good specifications that are gotten out for the ventilation of a metal mine wouldn't apply to the ventilation of a coal mine." That broad statement is not correct. There are a great many differences in the ventilation of a coal mine and the ventilation of a metal mine; but there are many things that are common to both and specifications that would apply equally well in laying out a good ventilating system for both.

I think the gentlemen who make these suggestions usually have in mind that standardization applies to equipment only. There is a very great confusion as to what standardization really signifies and what we are trying to accomplish when we say we are standardizing for the mining industry. If we were trying to standardize mine fans, then there isn't any question whatever that the combination of those two committees would be advisable, but that is not what we are trying to accomplish; we are trying to improve the practice and the methods of mine ventilation, so that if a man has any good fan he can get efficient and economical results out of that fan, or if he has a poor old fan, he will get the best results that that fan could furnish. If he has a mine that is improperly laid out, no fan can ventilate that mine economically and he is wasting power beyond comprehension due to bad methods of laying out his mine.

This is so universally true that one of the things that we can do for the mining industry is to improve their methods and practices in mine ventilation. It is not only of very great importance from the humanitarian standpoint but it is just as important from an economic standpoint. I have visited mines where they had a great, fine, modern fan that they were not getting twenty-five per cent. efficiency out of. They were spending four times on current what it should cost to produce the amount of air that they were giving the mine.

That is what we are trying to do. Whether the laying out of a metal mine for proper efficiency and economical ventilation is sufficiently identical with the best practices for a coal mine is for us to decide. My idea was that some special committee that we would form for other purposes as well could take that question under careful consideration, after they had read the report that was given by the two committees, see whether they are attacking the problems along the same line or not and the committee could then draw up some conclusion.

I have not read the report of the Committee on Mine Ventilation for the Metal Mining Branch, but I have read that for the Coal Mining Branch. This Special Committee could easily decide and make recommendations to this Congress at a later session whether we should combine those Committees.

That same argument will apply just the same to Mine Drainage. Everything that I have said regarding mine ventilation applies equally well to Mine Drainage. Mine Drainage is something that is very little thought of by the average operator, especially in the coal mining industry. Doubtless more thought has to be given to it in metal mining.

Underground Transportation is another identical Committee so far as the title is concerned. This Special Committee should take those two reports and see if they are sufficiently identical that the work of those Committees can be combined.

Now in case the report is adverse and they don't recommend it, we will reap very great benefit by having had a careful, critical study made of these two reports and learn (if we don't combine them) whether there are any conflictions in recommendations that should be common—there is no question that there are many of the recommendations made by those corresponding Committees that should be common recommendations that will apply to both Branches of the industry and a critical study of these reports will, therefore, harmonize the reports at least in the portions where they should be harmonized.

That gives you as plainly as I can my ideas regarding the recommendations that have been made for the combination of these Committees that seem to be identical. We could act on that now, or possibly better we could appoint a committee and finally act on it after we get their recommendation. I think that would be advisable but my idea in outlining the whole subject now was for you to decide whether it was sufficiently important to appoint such a committee. I would like to hear from some of the members of the Metal Mining Division and some from the Coal Mining Division as to the advisability of appointing such a committee and having these reports immediately turned over to them so that they can start the work of making this critical examination of these reports.

Will some member of the Metal Mining Branch kindly speak for that Branch?

MR. T. O. McGRATH: I hardly think that the Metal Mining Branch is far enough along to do what you wish to do. There is only one completed report, that is on Underground Transportation. Mr. Mitke was unable to be present because the sailing of the boat delayed him, and the Metal Mining Industry at the present time is very much depressed and has been all the year. Practically all the copper mines are shut down and have been since April. A number of the Committeemen who were in these organizations have either been relieved on indefinite leave or they have been curtailed and combined with others and they have not had the time to finish their work, and out of the eight committees, as I say only one (that is Underground Transportation) is really in shape to be considered by a Joint Committee.

So I would say at this time, should you appoint such a Committee, they would not have the data from the Metal Branch to properly pass upon it. Mr. Daly, the Chairman of the Underground Transportation Committee is here, and for Mr. Mitke I intend to appoint Mr. Daly to take charge of these reports. There is one finished report and seven progress reports. The finished report is very well arranged, very well compiled and very well summarized and should be very interesting to all those interested in Standardization. Mr. Daly will preside at the sessions of the Metal Mining Branch. We will have five very valuable presentations, and Mr. Arthur Notman will preside at the General Joint Conference for Mr. Mitke, and Mr. Daly will take charge of the reports. His report being the only finished one. (The others are progress reports.) Mr. Daly is well qualified to take charge of this work. He is a man of vast experience in the mining industry, especially in the Metal Branch, and I feel that you will all be satisfied with his efforts. Just what the Metal Branch will do with these reports, will be thrashed out this afternoon at their meeting.

The progress reports are very interesting and I believe that every one here will be interested in hearing those progress reports. They are more or less general, to bring out the meat of what we are trying to do and probably might be more interesting than the finished reports.

I trust that every one interested in Standardization will attend the Metal Branch meeting, even though they only have one completed report.

CHAIRMAN ROBERTS: Mr. Daly, you will kindly advise the gentlemen what you think of appointing this Special Committee to consider the three important questions that I have outlined for such Committee to take under consideration?

MR. WM. B. DALY: I have only had about a half hour to go over the progress reports of the different committees in the Metal Branch, and that was this morning. As Mr. McGrath has informed you, there is only one finished report. The others are progress reports and some of them are in such shape that I do not believe very much good could come from a Joint Conference by the Committee which you have suggested—that is in the way of any completed work. As far as discussion, I think it would be interesting. I would be in favor of the appointment of a committee from the two Branches to go into the matter as far as could be gone into with the reports that are available.

Anything that I could do in the matter to assist in framing the thing out, I will gladly do.

MR. McGRATH: Another point that I failed to mention, I had a letter from Mr. Mitke recently. He stated as a very small percentage of the metal men would be present, and the fact that the reports are also in progress and unfinished, that he thought it would be better to only deal with those reports that were finished, and to invite all those who were interested from a manufacturing standpoint or other view-points and to get all the data that was possible to accumulate to help these Committees go ahead and finish their work.

MR. DALY: I believe myself, too, Mr. Chairman, that that would be advisable.

The work as presented by the Committees as I have gone over the matter this morning, is not such that a completed report could be made by Mr. Mitke if he were here. I think these Committees will continue their work even after the adjournment of this Conference. I believe also, as Mr. McGrath has stated, it would be advisable for the Metal Mining Branch to frame a general report of the work so far as it has progressed, to Mr. Mitke for his final adoption and approval, and then submit it to the Standardization Conference of the two Branches at a later time for printing if they so desire.

CHAIRMAN ROBERTS: Dr. Payne, Chairman of our Committee on Outside Coal Handling Equipment, will you kindly advise the Conference what you think about the appointment of such a Committee?

DR. H. M. PAYNE: I think the idea is a very good one but I don't see how such a Committee could accomplish anything very definite with nothing but progress reports. Such a Committee should be appointed and should take this action, probably subsequent to these meetings, when the final reports are done—in other words, let's create the organization but we can't get final results out of that Committee at the present time. I believe the idea is a good one but I don't believe they can possibly get finished results.

My idea would be, Mr. Chairman, that such a Committee might very properly make a report perhaps two or three months from now or six months from now so that at the next annual session we would then be able to make the consolidation you have suggested.

CHAIRMAN ROBERTS: I might add in explanation, that these suggestions came from the working Committees previous to the rendering of any reports, on the supposition that those three Committees that I mentioned (Underground Transportation, Mine Drainage, Mine Ventilation) had work so similar that they recommended a combination of those Committees; and I would be adverse to putting off a decision until the next Standardization Conference a year from now, for the reason, already raised by these gentlemen, that we would be duplicating effort. I

believe that a Committee could call in the representatives from the Committees on the two Branches and hear the evidence and likely decide this matter intelligently without waiting a year. However, that is for the Conference to decide.

I have had this matter brought to my attention two or three times and I have opposed it for the reasons I stated to you, that the work was not sufficiently developed at that time that anyone could intelligently decide whether it would be an advantage or a disadvantage, but I believe the work is sufficiently developed now even from the Committees that are only going to render progress reports, that by studying those progress reports you can learn whether the work is sufficiently identical to warrant the joining of the two Committees in a joint effort instead of working separately as now.

DR. PAYNE: If that is your thought, I move that a Special Correlating Committee be appointed at this meeting to take such action and report back to the Conference.

The motion was seconded.

CHAIRMAN ROBERTS: Gentlemen, you have heard the motion, and with Dr. Payne's permission and the permission of the seconder, I would like to add here, too, the name I suggested for the reason that it may be confusing—we have a General Correlating Committee working under the American Engineering Standards Committee that is a general Committee that we all report to, and I had suggested the name, "A Special Joint Committee representing the two Branches of the Standardization Division." I think it would be less confusing, and with your permission we will consider your motion in that way..

DR. PAYNE: That is satisfactory.

CHAIRMAN ROBERTS: Are there any further remarks or suggestions regarding this Committee before we put it to a vote?

MR. McGRATH: What will be the duties of that Committee?

CHAIRMAN ROBERTS: Unless there are further suggestions, their duties would be those outlined in my report.

MR. McGRATH: Will this Committee have the power to combine the work or will it simply make a report?

CHAIRMAN ROBERTS: Make a report to the Conference.

Before you vote on this question please recall the three important suggestions I made for this Committee to take under consideration: One very important matter for them to consider was the method of procedure, which I have already outlined. The Committee can take the "Bulletin and read Secretary Callbreath's suggestions in his introduction of the "Bulletin," which would be the detailed matter that they would take under consideration. You see we have three important matters for this Committee to take under advisement and report back to the Conference at a later session.

Are there any further remarks on this question before we put it to a vote? If not, all in favor of the appointment of such a Special Joint Committee will please say "Aye." Contrary "No."

The motion was unanimously carried.

I will now give you a brief review of the work accomplished during the past year by the Committees of the Coal Mining Branch which will be followed by a review of the work of the Metal Mining Branch to be presented by Mr. McGrath.

In our "Standardization Bulletin" beginning on Page 30 you will find the Reports, Briefs of Discussions, etc., of the Coal Mining Section (Branch) and beginning on Page 60 corresponding reports, etc., for the Metal Mining Section (Branch) with the exception that by some oversight one important report of the Coal Mining Branch; namely, the Joint Report of the two Committees on Underground Power Transmission and Power Equipment were not printed in the proper order and will be found on Page 71 of the "Bulletin." I am assuming that all our members and guests have read these Reports, Briefs of Discussions, etc.,

and are, therefore, familiar with the work of our Standardization Division as presented in the "Standardization Bulletin." I will, therefore, only review the progress which has been made on our work since our last Standardization Conference. This review must necessarily be made by reporting on the progress made by each Committee.

COMMITTEE ON MINE DRAINAGE

As indicated by the report of this Committee last year they had made no particular progress and the Committee was therefore immediately reorganized after our last Standardization Conference. The results by the reorganized Committee have been most gratifying. Mr. E. D. Knight, of the Cabin Creek Consolidated Coal Company, Kayford, West Virginia, was induced to accept the chairmanship of this Committee and by diligent effort he and his Committee have presented a very satisfactory progress report.

COMMITTEE ON OUTSIDE COAL HANDLING EQUIPMENT.

A change in the chairmanship of this Committee was made immediately after the last Standardization Conference as the Chairman of your General Committee had previously acted as Chairman of this Sub-Committee and found it impossible to continue to direct this work. The American Mining Congress persuaded Dr. Henry M. Payne, Consulting Mining Engineer of New York City, to accept the chairmanship of this Committee. Dr. Payne somewhat enlarged his Committee, immediately laid out a good program for them to develop and has an interesting report for your consideration.

COMMITTEE ON MINING AND LOADING EQUIPMENT.

A change was also made in the chairmanship of this Committee as Mr. Carl Scholz who had previously directed this work, having assumed new and larger responsibilities, could not continue to handle this work and with his assistance we secured Mr. C. A. Cabell, Vice-President, Carbon Fuel Company, Charleston, West Virginia to act as Chairman. We regret to report, however, that Mr. Cabell has been facing so many difficulties, along with other operators of West Virginia, that he has not had the time to devote to this work which its importance justifies. This Committee, therefore, will not present a report but will offer a program for discussion at our Conference and we hope that by this method we will develop this subject and be able to have some sort of a report drawn up for this Committee to be contained in our next "Standardization Bulletin."

I have a suggestion to make regarding that report and corresponding reports from the Metal Mining Branch. That is, that the gentlemen in session at the Coal Mining Branch will take reports of that character under consideration and will endeavor, out of the material furnished by the Committee, to prepare at least a progress report that will be suitable to go into our "Standardization Bulletin" which we are going to issue early next year, so that we can put before the industry what we propose to do on that classification work, even though we have not a completed report.

Then the industry will have something to consider when they receive our "Bulletin."

COMMITTEE ON MINE VENTILATION.

This Committee presents a most satisfactory report, being an amplification and revision of the report they rendered at our last Conference in Denver. Many recommendations are offered by this Committee which will deserve the most careful consideration of our Conference.

COMMITTEE ON UNDERGROUND TRANSPORTATION.

I wish to call especial attention to the report of this Committee as the method of handling their work offers, to my mind, an excellent suggestion

for some of our other Committees. This Committee presented a very excellent report at our last Standardization Conference, which has acted as a basis for their work during the past year. On resuming their work this year they divided Underground Transportation into three classifications; namely, "Mine Tracks and Signals," "Mine Locomotives" and "Mine Cars" and appointed a Sectional Committee to develop a program and a report with recommendations to the main Committee. Their reports are therefore offered in this form; namely, One General or Reviewing Report and three Sectional reports on the subjects named. I suggest that some of our other Committees having classifications of work that could advantageously be sub-divided into sections, follow the procedure of this Committee for by so doing and carefully selecting the chairmen and members of such Sectional Committees the work can have more careful and detailed consideration.

JOINT COMMITTEE ON POWER EQUIPMENT AND UNDERGROUND POWER TRANSMISSION

When these two Committees started to develop their work last year they decided that the work was so intimately interwoven that they could conduct their investigations more advantageously by working together, they therefore followed this method and rendered a joint report. This report is the one referred to as being disconnected from the other reports and will be found on Page 71 of the "Standardization Bulletin." A review of this joint report indicates that a vast amount of careful and conscientious work was done by this joint Committee.

When we requested this joint Committee to prepare a program for this year's work they advised that they wished to delay further work on their subjects until they could receive the "Standardization Bulletin" and thereby furnish members of their Committees and also have for distribution to the Industry, copies of their last year's report together with discussions at the Conference, etc. Due to an unavoidable delay in the issuing of the "Standardization Bulletin" this joint Committee therefore did not undertake any work during this season and will have no report to offer at this time. They advised us, however, that they have followed the method of procedure suggested by Mr. Callbreath in his "Introduction" to the "Standardization Bulletin" and that on receiving replies from men in the Mining Industry and allied professions that they will then take under consideration the suggestions made in these replies and make such revision of their joint report as seems advisable.

That completes my report for the Coal Mining Branch.

If Mr. McGrath has any further presentation, we will now hear from him.

MR. T. O. McGRATH: There is hardly anything further to present on behalf of the Metal Branch other than what I have already said—that is that the Underground Transportation Committee has prepared an excellent report, very well compiled and arranged, and they intend to make detailed recommendations on the different points brought out at this meeting.

The Mine Timbers Committee has made an excellent progress report. In that connection I might mention that the U. S. Bureau of Mines have arranged for a display on Wood Preservation to be exhibited at Booth 171. This is an impartial display, under the jurisdiction of the United States Bureau of Mines. It does not represent any particular mine, and I am informed it is something of great interest to everyone interested in mining, especially mine timbering and preservation of timbers.

Mr. Daly will give you more information later. The Metal Branch is really here to do work more than to report. They want all those who are interested not only on the Committees but otherwise to attend the meetings and give all the assistance possible, but later they will have to send in their completed report.

CHAIRMAN ROBERTS: Before we adjourn, there are just one or two things that I want to speak about. First we should appoint this Special Joint Committee, and I would like suggestions from Mr. McGrath, after consulting with the gentlemen present representing the Metal Branch, as to the two members on this Committee that they will appoint.

I think that a Committee of Four would be sufficient. We want to take as few out of our working organization as we can, to take this matter under discussion, and if these gentlemen will give me the names after we adjourn of their two representatives, I will confer with the men immediately upon adjournment. If they will remain here for a few moments we will select the representatives so that we can turn this matter over to this special committee and they can take it under consideration.

You see one of the important objects of appointing this committee was not only to consider these two or three questions to report on later but I thought of taking the Committee on Underground Transportation—the two branches have finished reports and have good reports—I think this Special Committee could to advantage take those two reports and study them carefully and see whether there is any lack of harmony in those reports that could be harmonized. There may be things recommended, for instance, by the Committee on Underground Transportation in the Metal Mining Branch that will conflict with recommendations made by the other Committee in the Coal Mining Branch that could be harmonized and made practically identical in certain features of those reports and recommendations. There may not be, but very likely will be, and I think that is one of the very important things that this Committee could do for us.

MR. DALY: We would like to have a meeting or two of that division before that Committee would meet as a Joint Committee with the Coal Mining Committee.

CHAIRMAN ROBERTS: I have another suggestion to make to the Conference. Do we want a Resolutions Committee? The American Mining Congress will appoint, at least, if they follow the practice in the past, a Resolutions Committee which will be the busiest Committee in session at The American Mining Congress. This being a very large division, by far the largest division of The American Mining Congress and having very important work under consideration, I thought it quite possible that we would want a Resolutions Committee of our own to consider any resolutions that may be presented by members of the Standardization Division and review them before we sent it to the Resolutions Committee. We may have some recommendations that we want to make or resolutions that we want to present to the Resolutions Committee of the General Convention. If we do that we should have a committee to carefully consider any resolutions that may be suggested or handed in to our Conference before they are sent to the general Resolutions Committee.

Do you think it best for us to have such a Committee?

MR. JAS. MILLIKEN: I think it is very important that the Standardization Branch, particularly the Coal Mining Division, have such a Committee, and I make a motion that you appoint a Committee of that kind.

The motion was seconded by Dr. H. M. Payne.

CHAIRMAN ROBERTS: It has been moved and seconded that the Conference appoint, through their Chairman, a Resolutions Committee. Are there any further remarks or suggestions on this question? If not we will put the question.

The motion was carried.

CHAIRMAN ROBERTS: I will, after consulting with the members of the two Branches, appoint a Resolutions Committee.

If any of you have anything on your minds that you want to present to the Resolutions Committee of The American Mining Congress for their consideration, please hand it in, in written form to this Resolutions Committee for their consideration.

At our St. Louis Convention two years ago we presented two of the most important resolutions that were offered in the convention from our Standardization Division and they were both adopted by the Resolutions Committee and by the Convention. I was on the Resolutions Committee that year myself, and there was more earnest discussion brought about by those two resolutions handed in by the Standardization Conference than any other resolutions that were presented to the Resolutions Committee, that is, the general Resolutions Committee of the convention.

We would be very glad to have any gentlemen who have any suggestions to make to the convention to pass them in to our Resolutions Committee.

If there is nothing more, we will adjourn.

The meeting adjourned at 12:00 m.

ADJOURNMENT.

COAL MINING BRANCH

October 17, 1921—2:30 P. M.

The first meeting of the Coal Mining Branch of the Standardization Division of the American Mining Congress, Monday afternoon, October 17, 1921, convened at two-thirty o'clock, Colonel Warren R. Roberts presiding.

CHAIRMAN ROBERTS: This is the First Session of the Coal Mining Branch called for on our program at two-thirty P. M. Before I start in on our program, I will announce the Special Joint Committee that was authorized this morning, as recommended by your Chairman. Representing the Metal Mining Branch we have Mr. William B. Daly and Mr. Arthur Notman and representing the Coal Mining Branch we have Colonel J. Milliken and Mr. E. D. Knight. That is the Special Joint Committee, to whom we will refer our reports for consideration as recommended by your Chairman.

You will notice according to our program that this afternoon's session is to be devoted to the receiving and consideration of reports from our Committees and the first report that we are going to call for is the one on "Mine Drainage" by Mr. E. D. Knight of Kayford, West Virginia.

REPORT OF THE COMMITTEE ON MINE DRAINAGE

It is the opinion of your committee that the subject of MINE DRAINAGE should be taken up under two heads, namely: (1) Mine Drainage by Pumping or Mechanical Means; (2) Mine Drainage by Other Methods.

1. MINE DRAINAGE BY PUMPING OR MECHANICAL MEANS

Were it possible to standardize the design of mine pumps, this committee could only recommend such procedure in the event that we believed that the ultimate achievement in such design had been reached and that no benefit could accrue either to user or maker from the competitive manufacture of such equipment. This is patently not the case and we have consequently attempted to perform our work along lines, which we consider more useful to all concerned.

It is our belief that there are a number of different sorts of problems which confront us in Mine Drainage, and though these differ widely due to local conditions, we think that they may be roughly separated into several general classes from the standpoint of service required from pumping equipment.

We have attempted therefore, to divide drainage problems into these several classes, and to set down certain specifications for pumps suitable for service within each class, which in no way limit the design of such equipment but rather set for each a criterion of performance within its group.

We have further appended a list of what we believe to be good

and safe rules for the installation, and operation of mine pumps, and we recommend same as standard practices.

A short discussion of other means of mechanical drainage is also included.

A. CLASSIFICATION OF MINE DRAINAGE PROBLEMS WITH RECOMMENDATIONS AS TO PUMPING EQUIPMENT.

I. DRAINAGE OF WORKING PLACES.

(a) This classification, usually termed "Gathering Work," is generally applicable to rooms or entries driving toward the dip, where there is a constant flow of water sufficient to impede the proper removal of coal. Pumps are necessary when the volume of water makes bailing uneconomical. Discharge lines are usually carried to sump for removal by larger pump, to drainage ditches, or to abandoned workings.

(b) We recommend the following specifications for gathering pumps.

1. CAPACITY.

Sufficient to keep down the flow of water by continuous pumping throughout the working day, and to handle water accumulating through the night in the most economical manner to have place dry for resumption of work. Too large an equipment increases inefficiency of unit as steady flow necessitates continuous pumping and number of gallons per minute pumped cannot exceed that of flow regardless of size of equipment. A capacity of twenty to sixty gallons per minute is usually applicable to most gathering installations.

2. HEAD.

A head in excess of 125 feet usually presupposes a permanent installation for taking water outside the mine. We recommend this as a maximum head for gathering pumps, and further recommend a limitation of motor horsepowers to protect such pumps from improper installation.

3. PORTABILITY.

Gathering pumps are usually moved for two reasons, namely: Development of place beyond the suction limits of the pump; elimination of condition which brought about installation, either through the working out of the place or rise in the floor of the mine causing a natural drainage away from the working face. We recommend that pumps moved less than twice yearly under normal operating conditions be not classified as gathering pumps. We further recommend that gathering pumps be as light and compact as possible and that the weight of the assembled unit be the minimum in keeping with sturdy construction.

4. PERFORMANCE.

We recommend the selection of a pump for gathering work which will start without priming, pump air and water alternately, keep a flow of water with the suction only partway submerged, pass small chunks of coal and other extraneous matter through its valves, have valves readily accessible for cleaning, and function properly with a minimum of attention. This would seem to limit selection to positive acting pumps and for simplicity of design and fewness of working parts, we recommend a single cylinder double acting piston pump for this purpose.

II. DRAINAGE OF ISOLATED BODIES OF WATER.

(a) This condition is usually brought about by swags or low spots which collect sufficient water to interfere with haulageways or which if not kept dry will allow the water to overflow to places here it will otherwise hamper the operation of the mine. Such conditions necessitate the installation of a permanent pump.

(b) We recommend the following specifiiations for pumps to meet this condition.

1. CAPACITY.

Where volume of water is such that it need be pumped out only once daily, a pump of sufficient capacity should be installed to drain said place during part of the working day, so that in case of necessity repairs may be made without impeding the operation of that section of the mine. Where the volume of water is sufficient to preclude such practice, the installation of a sump is recommended. Same to be of sufficient capacity of prevent damage to that portion of the mine due to a few hours interruption of pumping.

2. PERFORMANCE.

Where power interruptions are likely to be frequent and it is desirable to mimimize attendance, a positive acting pump which does not require priming is recommended.

III. UNWATERING OF ABANDONED WORKINGS.

(a) Often it is desirable to reopen abandoned workings which have been allowed to fill with water due to lack of pumping for several years where there is only a moderate flow under normal conditions, seasonal influx of surface water, or the diverting of drainage from other portions of the mine into same. This condition usually implies the installation temporarily of a larger pump for the unwatering than is necessary for proper drainage under normal conditions.

(b) We recommend the following specifications for pumps to meet this condition.

1. CAPACITY.

Sufficiently to economically remove the water within a reasonable length of time. This means a capacity ample to take care of the natural flow of water, if there be such, and at the same time remove the desired amount of accumulated water.

2. PERFORMANCE.

Where head conditions are adapted to same a centrifugal pump is recommended due to its lightness, compactness, and to ease with which it may be installed in crowded places difficult of access. Precaution should be taken, however, to be sure that during the process of unwatering, the pump will not have to be moved sufficiently to vary the head beyond the limit of flexibility of this type of pump. If such is likely to be the case a positive acting pump should be used. Water which has been standing some time in a mine is likely to become high in content of sulphur or other injurious chemicals. It is good practice to have such water analyzed before purchase of a pump and if such be the case use a bronze fitted pump or one with a complete bronze water end.

IV. DRAINAGE OF SUMPS, WHERE WATER COLLECTED FROM OTHER PARTS OF THE MINE IS DISCHARGED, OR OTHER LARGE BODIES OF WATER.

(a) This condition usually implies a body of water sufficient in quantity to interfere with the entire operation of the mine if same is not kept properly drained.

(b) We recommend the following specifications for pumps to meet this condition.

1. CAPACITY.

Sufficient to handle the situation under maximum water conditions and consisting of one or more units.

2. RESERVE CAPACITY.

One or more units for standby in case of breakdown capable of duplicating in performance the regular pumping equipment.

3. PERFORMANCE.

Where head conditions are adapted to same, centrifugal pumps are recommended due to their economy of space and simplicity of working parts. Where electric power source is unreliable and when pumps are located within the limits of economical steam transmission the use of steam pumps is considered good practice. It must be remembered, however, that use of steam pumps, unless compounded is very wasteful. Where both steam and electricity are obtainable, if danger from interruption is sufficiently grave, units may be so selected as to make either source of power available for pumping.

B. GENERAL RECOMMENDATIONS FOR THE MANUFACTURE AND SELECTION OF MINE PUMPS.

We recommend the following:

1. That wherever possible United States Standard Thread be used on all bolts, nuts, and plugs.

2. That as few different sizes of bolts, capscrews, studs etc., be used in the construction of a mine pump as are compatible with good design.

3. As complete a standardization of pumping equipment by individual users as conditions will permit and when a purchaser is on the market for additional equipment, the keeping in mind of the fact that, all other things being equal, a saving in initial cost, unless very considerable in amount, rarely compensates for having to keep two different sets of repair parts in stock.

C. STANDARD PRACTICES FOR THE INSTALLATION AND OPERATION OF MINE PUMPS.

I. PIPE LINES.

We make the following recommendations in regard to mine pipe lines.

(a) Pipe lines should always be large enough so that the friction head combined with elevation against which the pump is working is well under the total head against which the pump is designated to operate. Lines of sufficient size to restrain velocity of water from rising above six feet per second are preferable. The following friction tables should be used for determining the sizes of all pipe lines.

Friction Loss of Head in Feet Per Thousand Feet Pipe.

G. P. M.	1.5″	2″	2.5″	3″	4″	6″	8″
30	110	38.4	12.9	5.4	1.32	.20	
40	188	66	22	9.1	2.23	.30	
50	284	99	33.2	13.8	3.39	.46	
60		139	46.5	19.2	4.72	.67	
70		184	62	25.7	6.3	.86	
80		237	79	32.8	8.1	1.12	
90		294	98	40.8	10	1.42	
100		358	120	49.6	12.2	1.73	.45
140			223	92	22.8	3.12	.78
200			431	178	44	5.9	1.50
240				251	62	8.3	2.12
300				380	93	13.0	3.2
400					160	22.0	5.45
500						33.6	8.2
600						46.0	11.5
800							19.0
1000							30.0

Note: This table is taken from "Hydraulic Tables" by Gardner S. Williams and Allen Hazen.

The friction in a 90 degree elbow should be regarded as equivalent to one hundred feet of straight pipe. As a general rule we recommend increasing and never decreasing, the size of pipe over the pump connections.

(b) The use of boreholes to the surface for the discharge of all permanent pumping stations is recommended unless some specific local condition makes same inpractical.

(c) The use of wooden discharge lines or lines of other acid resisting materials, together with cast iron suction lines is recommended where chemical content of the water makes wrought iron lines short lived.

(d) Where pipe lines parallel haulageways in which the rail is used as a return circuit, the line should be bonded to the rail as specified by committee on Underground Power Transmission to prevent electrolysis.

(e) The installation of valves at convenient points in discharge lines to draw off water for sprinkling dust is considered good practice.

II. PERMANENT UNDERGROUND PUMP STATIONS.

(a) All Permanent Underground Pump Stations should be installed as specified in rules for underground stations in report of Sub-Committee on Underground Power Equipment.

(b) All steam driven pumps should have well insulated lines, expansion joints, and the lines should show no signs of escaping steam.

III. TEMPORARY OR PORTABLE PUMP INSTALLATIONS.

(a) All temporary or portable pump installations should be wired as specified by Committee on Underground Power Equipment.

(b) Wherever possible pumps should be so placed in relation to the body of water to be pumped that a shut down for a reasonable period of time will not place the apparatus in danger of being drowned out nor handicap the workmen in repair of same.

IV. STARTING EQUIPMENT FOR ELECTRICALLY DRIVEN PUMPS.

(a) The use of Hand Starting Rheostats on direct current pump motors is condemned as an unsafe practice. The likelihood of uneven acceleration, the not uncommon failure of handle to fly back to off position on interruption of power supply, and where interruptions are frequent and attendance lax the danger of having the handle tied back, make this method of starting motors both dangerous and unreliable.

(b) The use of Automatic Starters is recommended for all direct current pump motors and great care should be taken in the application of same. A careful study of load and voltage conditions should be made in each case and the fact always kept in mind, that where one type of starter will work admirably under one set of conditions even when installed on an identical equipment under different conditions it may be a total failure.

(c) Due to the freedom of most alternating current circuits from interruptions and the high initial cost of alternating current automatic starters, we recommend enclosed starting switches with no voltage release and overload protection on motors up to and including seven and one-half horse power, unless load conditions do not permit their being thrown across the line. For larger motors automatic starters are recommended unless local conditions do not justify their expense, in which case we recommend hand compensators.

(d) Where the pump operated requires the presence of an attendent after each interruption to see that same is properly primed or for any other reason, we recommend starters which have no voltage release but which accelerate automatically on the closing of a hand operated pilot switch.

V. GUARDING OF EXPOSED PARTS.

We recommend conformation to State Compensation laws as regards the protection of all gears, pulleys, and projections on revolving shafts. Where state laws are lax, we recommend compliance with Rules 1, 2, 5, 6, and 12 under Item 26, General Bituminous Coal Mine Safety Standards 1921.

VI. LUBRICATION.

We recommend frequent and careful inspection in regard to lubricating system of all mine pumps and motors and the equipping of all mine pumpers with proper oil and grease containers which will exclude extraneous matter from their content.

VII. INSULATION.

Where pump motors are to be installed in particularly damp places, we recommend the specification of especially impregnated windings in the purchase of such motors.

VIII. CARE OF PUMP MOTORS WHEN NOT IN USE.

Where pumps are shut down over periods covering several weeks, we recommend the removal of the motor to a dry place, or in direct current motors, the removal of field coils and armatures, or where this is impossible the running of such motors for an hour or more daily in order to prevent damage to the windings through mildew and dampness.

IX. SEMI-REMOTE CONTROL FOR PROTECTION OF OPERATORS.

We recommend the placing of a switch in the main feed line or a switch which will open the circuit of the starting device in such place in relation to the installation that the operator may open the circuit in cases of emergency without subjecting himself to danger from flying pieces in case of breaking a connecting rod, gear, or similar part.

X. DISCHARGE VALVES.

To reduce the possibility of the breakage of parts in reciprocating pump always be sure that all valves in the discharge lines are open before starting pumps.

XI. PRIMING OF PUMPS.

Few pumps if any can be depended upon to pick up their water and prime themselves when absolutely dry and where there is very much suction lift and especially where pump is to deliver water into a line already under pressure. It is therefore absolutely necessary in some cases and always desirable to see that pumps are carefully primed before starting.

We therefore offer the following suggestions for the proper priming of pumps.

(a) Piston and Plunger Pumps.

If pump to be started is New or has not been operated for some time all suction and discharge valves should be lifted from their seats to make sure that each will operate freely—then with the discharge valve cover plates removed, lift one discharge valve in each chamber and fill the cylinder and valve ports in that chamber entirely full of water. Replace all cover plates and after seeing that there is a free outlet to the atmosphere, start pump and run until all air is pumped out and clear solid water is delivered. Pump is then ready to operate on regular conditions. It is seldom necessary to repeat this priming operation although it is always good practice to have discharge line connected up to include a Tee with valve or cock so that at any time the pump can be operated against atmospheric pressure only and so make sure all cylinders and valves are working properly.

(b) Since a Centrifugal Pump together with its entire suction line must be wholly free from air, priming is of great importance and some positive method should be adopted. We offer the following suggestions:

1. **Never try to prime a centrifugal pump while it is in motion.**

2. **Always Use a Good Strainer on the Suction Intake.**

3. **Priming by Use of Foot Valve.**

Where pump is in low lift service a plain combined Foot Valve and strainer may be used on the suction intake pipe and water poured into an opening provided for the purpose and at a point higher than the top of pump shell, a pet cock should be screwed into the highest point of the pump shell and kept open until all air is expelled. Pet cocks should also be screwed into any high spots in the suction line where air would be trapped. When water flows freely from highest pet cock, pump is then primed and should be started immediately. It should be

remembered always that a Centrifugal pump will seldom operate against a pressure when air gets into the pump either through the suction pipe or the stuffing box or any other place. When pump is to operate on a high head, a very dangerous pressure may be developed in the pump shell and suction pipe and fittings when pump is stopped by the resulting back surge of the water. Pumps under these conditions should therefore be protected by a swing check valve on the discharge and a By-Pass put in to run water from the discharge back through the pump into the suction, otherwise proceed as under low head conditions.

4. Priming Without Use of a Foot Valve.

It is often very desirable to eliminate entirely the use of a foot valve, in which case the pump would be primed by exhausting all air from the pump and suction line, using a check valve or gate valve or both in the discharge line near pump to prevent any air from coming in through the discharge connection. In order to get an air tight shut off it might be necessary if pump has been out of use for awhile to run some water in the discharge to seal the valve. To exhaust the air we suggest the following methods:

(a) When pump and connections are comparatively small connect the suction of a small pitcher spout pump or any good hand pump including the horizontal double acting type, to the highest point of pump shell. Prime the hand pump with a very small quantity of water and operate until all air is exhausted and clear water is delivered. Then close valve in suction connection to top of pump shell and start centrifugal immediately. Remember that a centrifugal pump can be started or operated a short time without injury against a closed line where in the case of a recriprocating pump something would be sure to break.

(b) By the use of a small double acting motor driven piston pump connected to top of pump shell the same as with hand pump.

(c) By the use of a steam ejector, if steam is available, connect suction of ejector to top of pump shell with valve or cock and operate until pump is primed and proceed as above.

(d) By the use of a hydraulic ejector used the same as steam ejector provided water under a pressure 20 pounds or more can be obtained. Sometimes there is sufficient water stored in the discharge line beyond the check valve to properly prime a pump by the hydraulic ejector, in which case a hand pump as under (a) should also be installed to have a positive method available.

(e) By use of Hydraulic Ejector operated by a small auxiliary direct connected motor driven pump taking water from the bottom of a barrel and discharging about 40 to 50 gallons per minute at 20 pounds pressure through the ejector back into the same barrel.

XII. ATTENDANCE.

(a) We recommend definite fixing of responsibility for the operation, care, and inspection of each piece of pumping machinery in such a manner that same will be insured of proper attendence at regular intervals, and will not be forced to rely on haphazard attention delegated to whoever happens to be in the vicinity at convenient times.

(b) We recommend more careful selection of pump attendants and believe that more stress should be laid upon a man's fitness for the job, and that the operating of mine pumps should be not regarded as a system of pensioning men unfit for more useful work as is often the case at present.

(c) We recommend equipping mine pumpers with proper tools for the work they are required to do and the adoption of systematic methods for making them responsible for these tools. This we believe will in many cases prevent damage from the use of makeshift tools or from bolts, nuts, valve covers, etc., which work loose, not being properly tightened.

(d) We recommend the general principle of making every installation as "foolproof" as possible and then getting the best man obtainable to look after it.

D. OTHER METHODS OF MECHANICAL DRAINAGE.

I. AIR LIFT PUMPING.

Air lift may be used to advantage when it is advisable to keep the pumping equipment on the surface.

II. WATER HOISTING.

We believe that the number of mines at which water hoisting can be economically carried on is too limited and the individual application of this method of drainage too varied to make any recommendations concerning same.

2. OTHER METHODS OF MINE DRAINAGE.

A. THE SIPHON.

I. We offer the following suggestions for the installation of mine siphons.

(a) That all joints be carefully made and all threads be examined before joining to insure as near an absolute exclusion of air as is humanly possible.

(b) The use of a larger size of pipe on the suction leg of a siphon than on the discharge leg, in order to lessen the resistance of the water in entering.

(c) The elimination of all sharp bends in a vertical plane, which would tend to form air pockets and the laying of the siphon as nearly as possible on a gradual uniform grade.

(d) Submergence of the discharge end of the siphon either in a sump, small tub or barrel, or by using an elbow and nipple on the end of the discharge the same making a right angle with the line on a vertical plane.

(e) In charging the siphon it is good practice to have the charging point at or near the high point of the discharge leg but this is not absolutely necessary as the siphon may be charged near the suction end. It will be found good practice to tap the discharge leg at its highest point and here connect a stand pipe to allow air to escape while siphon is being charged. When all air from the siphon has been expelled the water will flow smoothly from the stand pipe. When this point is reached close valve on stand pipe and gradually open valve on discharge end. Siphon may also be charged by use of common pitcher spout pump, the same placed either on the end of the discharge leg, or where temperature conditions do not permit or same interferes with submergence, at the same point as the standpipe referred to above.

II. THE SIPHON IS RECOMMENDED FOR THE FOLLOWING USES.

(a) Bringing water from one level to another inside a mine where ditching would be too expensive.

(b) Draining bodies of water which collect in low places near drift mouths, usually due to seasonal influx of surface water.

(c) Draining abandoned workings which have been allowed to fill up with surface water.

III. LIMITS OF THE SIPHON.

The theoretical limit to which water can be raised with a siphon is thirty-four feet at sea level. From fifteen to twenty feet seems to be the practical limit in mine use. We do not recommend the use of the siphon where it cannot be installed properly without the removal of so much rock or slate as to make its economy as compared to pumping doubtful.

B. DRAINAGE DITCHES.

I. We recommend closer cooperation between Engineering, Operating, and Power and Mechanical departments of all mining companies to the following end.

(a) That when a drainage problem first appears, the levels of the mine be gone over carefully to see if this water cannot be economically handled by ditching instead of a hurry call being sent in for a pump.

(b) That where several bodies of water are to be handled in the same mine, a careful survey be made to see if this water cannot be collected by ditching to a central point for disposal.

(c) To be sure that all mechanically handled water is being

disposed of in the proper places, and that no water is being unnecessarily pumped when it could be handled in a simpler manner.

II. We believe that there is too great a tendency on the part of operating men to handle drainage problems as they have been handled in the past and to fail to look forward to future benefits which may accrue from changed methods. We desire to call attention to the fact that a permanent system of drainage ditches often implies a considerable outlay of initial expense, which unfortunately in many cases seems to form a barrier beyond which the operator refuses to look, thereby losing sight of the fact that when such a system is properly installed, the expense generally stops there, while an elaborate pumping equipment usually means a continual expense for upkeep, operation, and depreciation during the life of the mine. Further than this it must be kept in mind that a properly installed system of ditch drainage is much more reliable in operation than drainage by any mechanical means. We therefore recommend the following procedure in considering the solution of new drainage problems or the improvement of existing ones which are proving both troublesome and expensive.

(a) Determine whether or not the construction of a drainage ditch is possible. By possible we do not mean whether on the face of it it appears practicable but whether from an engineering standpoint it can be done.

(b) Estimate the expense of constructing such a ditch taking into consideration cost of excavating, material for lining and the placing of same, and interest on investment.

(c) Divide this total by what may be reasonably estimated as the life of the mine or that portion thereof which requires drainage.

(d) Balance this against the annual investment for repairs, attendance, interest on investment, and depreciation of proposed or existing pumping installations.

(e) Remember that should these show an equal yearly average of expenditure or one slightly in favor of the pumping equipment, that the balance should still be in with the drainage ditch due to its greater reliability of operation and its freedom from the possibility of breakdowns which might hamper the production of the mine as well as bring about unforeseen damage. Also the removal of the responsibility and worry of operating pump equipments from the executive force of the mine should tend to increase their efficiency in other phases of coal production.

With a system of ditch, or tunnel, drainage a great advantage is obtained in case of shut downs from any cause whatever as your drainage will continue without the cost of power and practically without attendance.

E. DRAINAGE OF BOREHOLES.

It has in some few cases occurred that a seam of coal has been operated above a worked out seam, or one where there is good natural drainage, so that it was possible to put down a borehole connecting the two seams, and thereby drain the water in the upper seam into the workings of the lower. We recommend this simple and effective method of drainage to those so fortunate as to have conditions where it can be made operative.

Respectfully submitted,

E. D. Knight, Chairman.
M. C. Benedict,
Walter D. Stockley,
E. F. Austin,
Cecil W. Smith,
F. J. Emeny,
Professor John W. Hallock,
R. Y. Wert,
J. H. Edwards,
L. D. Tracy,
M. Spillman,
Henry E. Cole.

CHAIRMAN ROBERTS: Gentlemen, you have just heard the report and recommendations of your Committee on Mine Drainage. I notice by referring to the personnel of this committee that it is composed of four independent consulting engineers, three representatives of standard, well established mine pump manufacturers, and the others are all operating men for coal mines including the chairman of the committee, and other engineers that are in responsible positions of maintaining mines as far as their drainage is concerned, like Mr. Wert, the Mine Drainage Superintendent of the Soddy Coal and Iron Company.

I only mention this to indicate to you the care with which these committees have been selected. We have tried to have each and every committee cover the entire field by having those three branches of the industry represented, the same as this committee represents those three branches of the industry.

I think this report typifies what I have tried to impress upon all of the committees in approaching this question of standardization—that before attempting to standardize equipment they should carefully consider the larger problems connected with improving the practice and methods in connection with their work, and you will notice throughout that the great burden of the report is to try to accomplish those ends and thereby improve the conditions of mine drainage at our mines, where we all know there is a large field for improvement.

There is an immense amount of material in this report, and if we were to go into it in detail, it would take us a day to digest it, and that was one reason that I recommended that these reports, after consideration by the Conference, should be referred to a committee for more careful and detailed consideration. It is not possible for us to hold in our minds all of the splendid recommendations made by these committees, but it is quite possible that some of you may be impressed with certain recommendations that have been offered, to which you take exception, and if so now is the time to offer your suggestions to the Conference.

We would like to hear from any one who has followed this paper and has heard any recommendation made by this committee that does not appeal to him or that he thinks he can improve upon. That is the object of reading these before the meeting.

MR. KUDLICH: In relation to the installation of electric pumps, Mr. Knight quotes the National Electric standard, I think it is, and in the protection of the circuits, the starting devices, circuit breakers, etc. I think the Underground Power Transmission Committee in their report have covered that from the standpoint of the electrical engineer rather than the mechanical engineer, and I think I have drawn up pretty good rules on that. I would suggest that this report be amended to refer back to the other committees report rather than adopt new rules on those questions.

MR. KNIGHT: Mr. Chairman, the only time any mention was made of wiring was when I did refer to that report in one instance in the case of a permanent pumping station. The only other instance was in the portable, or temporary stations, and I said, I believe, in the report, "As nearly as possible, the wiring is to conform to underwriters' rules," and if I remember correctly, that was pretty much the same way that was brought out in the other report that Mr. Kudlich mentioned.

Of course if a pump is going to be moved about, it is not possible to absolutely conform to any set of wiring rules, but my idea in mentioning that was really to set some standard to aim at and if you got half way there, you would probably be better off than if you aimed a little lower and did not get quite to that.

The only other mention that was made of wiring was in the case of control, and of course that is merely a proposition of selection and not the method of installing.

CHAIRMAN ROBERTS: I think Mr. Kudlich's suggestion, notwithstanding the defense given by the chairman, is an excellent one and is exactly what your Chairman had in mind when he said that these reports must be correlated.

Are there any further remarks or criticisms to be offered on this report? Please do not hesitate to make any criticism or suggestion that occurs to you. We want the broadest possible discussion before we refer them to the Committee, and then the Committee will give them more detailed consideration.

MR. VAUGHAN: There is one thing that I would like Mr. Knight to explain, relative to the syphon. He goes on and recommends certain ways of putting it in, and so forth, but he does not say anything about how it should be charged nor where it should be charged. My experience with syphons is that in the winter time, if we put a pump on the lower end, the pump will freeze and we will have a lot of trouble with it. I would like to have his recommendation as to where the syphon should be charged.

CHAIRMAN ROBERTS: Where would you recommend, Mr. Vaughan?

MR. VAUGHAN: Inside of the mines at the summit of the syphon. That would be my idea about it.

CHAIRMAN ROBERTS: What does the chairman think of that?

MR. KNIGHT: Where weather conditions are likely to affect the syphon, I think that that is entirely correct.

CHAIRMAN ROBERTS: Could the committee prepare general specification covering that point and incorporate it in their report?

MR. KNIGHT: Very easily.

MR. EMENY: I might say that we had a little experience with the syphon recently and the very simplest way of putting the syphon into action, and the cheapest, is merely to attach an ordinary kitchen pump to the high point in the pipe. That exhausts the air as thoroughly as anything else. With a short pipe it does it very thoroughly and very satisfactorily indeed.

CHAIRMAN ROBERTS: You see, gentlemen, how much good we get out of discussion and the way we perfect reports that have been prepared with the great care that has been devoted to this report. We are all anxious to make this report as perfect as possible.

MR. QUARRIER: The only thing I have to say about the syphon is that it is a bad thing to recommend to anybody. It is very costly. A little chunk of slate will put it out of commission and it will take hours to find where your trouble is.

In locating the point of starting the syphon, it should be a little bit to the discharge end of the summit because your kitchen pump will draw the water up and you want that water to run over into the discharge end. The discharge end will have to be stopped. Then when you have got all the air out and are pumping water without any trouble, you can go down to the other end and open up your syphon and it will run if you have no other trouble.

CHAIRMAN ROBERTS: Do I understand from the statement that you would not under any circumstances install a syphon?

MR. QUARRIER: Not if I could do anything else. There are some circumstances where you have to do anything. You can't set up any rule that you would not install a syphon, but I would not recommend it to any friends of mine.

CHAIRMAN ROBERTS: Has the chairman any reply to make to that statement?

MR. KNIGHT: I think it is entirely dependent upon conditions. I think there are some cases where the syphon would be very useful and very economical. However, the point that I tried to bring out and perhaps did not bring out very clearly was that if you can't install a syphon right, you might as well not try to install it. There has to be a great deal more care in the installation of a syphon than in the installation of a pump.

CHAIRMAN ROBERTS: Would I draw the conclusion then, Mr. Knight, that where conditions are favorable, and if you know how to install it, then you could recommend it?

MR. KNIGHT: I would recommend it and I tried in the report to limit the recommendation. We recommended it under certain circumstances where the water could be handled, if it could be handled; without the initial expense of an expensive pumping equipment; the syphon might be better and more practical.

MR. WERT: I was going to speak along the same line as Mr. Knight. I am on Mr. Knight's committee. I have seen some syphons that worked successfully. As Mr. Quarrier says, sometimes you spend a lot of time getting them in shape but after you do, if you have a big body of water to remove, you can remove an immense amount of water with the syphon. As to the charging of it, I have seen them charged almost at the suction end. We have done away with a great deal of trouble by putting what we call a "stand-pipe" in. Of course in that case you want a valve at your discharge to close that, and this stand pipe, which will stand probably five or six feet higher than any other point in the pipe, will let all the air escape, and when the water begins to flow out of that, if your syphon line is tight, you are going to move a big body of water before it takes enough air to stop the suction.

COL. MILLIKEN: I don't know very much about this mine drainage and I would like to ask Mr. Knight a question if I may. If your conditions are right with a syphon and it is properly installed, is there anything that is more economical?

MR. KNIGHT: You are not consuming any power either in steam or electricity moving that body of water and further you have no interest or depreciation on your pumping equipment.

COL. MILLIKEN: Then it is an economical proposition?

MR. KNIGHT: Yes, provided it can be installed right and can be installed at reasonable expense. I know we had one particular case

that I have in mind where we were draining a portion of a mine which had been at one time, through bad judgment, pumped full of water from another portion of the mine, and we used pumps. We tried a small syphon unsuccessfully for a time, and finally we went to work and put in a larger syphon and put it in right, moving some slate and that sort of thing. Formerly we had been dipping and bending around and were coming out through an old entry that was pretty well gobbed up, and we had not gotten the syphon to work but when we did get it installed on a pretty good uniform grade and had eliminated the short curves, we drained that entire body of water in a comparatively short time and in a very economical manner.

MR. COLE: I regret that I did not hear the first part of this very comprehensive report but it seems to me that a little something added as an appendix on the priming of pumps would be pertinent. We have to send out service men repeatedly and go to considerable expense. We find it is simply a matter of priming. A little education in this line will go a great way toward saving big losses and expense on the part of other people. Any other data in the line of taking care of ordinary pump troubles, put in a comprehensive form, I think would also be of value.

CHAIRMAN ROBERTS: Is there any further discussion of this report?

MR. LANDIE: Before we get away from the syphon proposition, I have seen numerous cases where it was the best thing that could be used. In fact there are quite a number of them in use in West Virginia today. In some gaseous sections of the mine where it is unsafe to try to lay the wires and you don't have too much slate falling, we have installed quite a number of these syphons, which keep down the water, and thereby avoid any interruption of the ventilation. I have seen syphons work for eight or ten months without being charged. I have seen them working on different pumps by means of floats, so I don't think it would be out of the way to recommend them.

CHAIRMAN ROBERTS: Did you hear the entire report read?

MR. LANDIE: Yes.

CHAIRMAN ROBERTS: Have you any recommendations for any additional specifications that would help to make the syphon more safe to install so that when the Committee recommends them, they will add sufficient specifications for the man who is not experienced. You gentlemen have had experience, but there may be occasions where an engineer is a good mine drainage man but has never had any experience with the syphon. Now he wants to know how to install one. Let's make it perfect enough so that this man who has not had the experience that you and Mr. Knight have had can install the syphon and then it will work and he won't come back and say, "Well, that committee recommended something bad."

MR. LANDIE: Before this Special Committee meets I will give Mr. Knight a few points on what I have seen in actual operation.

CHAIRMAN ROBERTS: My idea was to give actual methods of installation and operation for each and everything that you recommended, enough in detail to guide the average man, not the expert.

Is there any further discussion on the paper? If not, we will now refer this paper to the Special Committee.

We will now call on Dr. Payne, Chairman of the Committee on "Outside Coal Handling Equipment."

DR. H. M. PAYNE: The Committee is unable to render a complete report on all of the items before it, because the Bureau of Mines now has in preparation certain recommendations which we desire to go over and to incorporate. We want to coordinate those with a recent publication of the United States Steel Corporation and with the recommendations of the National Safety Council and the different coal mine rating bureaus.

On that account, therefore, we can only make certain definite recommendations and the others will have to go over until the later report.

REPORT OF THE COMMITTEE ON OUTSIDE COAL HANDLING EQUIPMENT

It is understood that brakes and other features of mine cars, as well as safety track devices for these cars above ground, will be covered by the sub-committee on Underground Transportation.

THE FOLLOWING RECOMMENDATIONS ARE OFFERED.

(1) In the matter of safety blocks and stops for inclines, it is recommended that all shafts, slopes and inclines shall be provided with safety blocks or derails, which shall positively prevent cars from passing into or down such places except when under absolute control. Such blocks or stops shall be so arranged that they shall protect, except when manually held in operative position.

(2) It is recommended that the handling of railroad cars under the tipple be either positive or negative, and not neutral, i. e., in the case of a flat grade, the cars should be pulled under the tipple, or in the case of an inclined grade, a car retarder should be used, and in no case should cars be permitted to run free.

(3) The committee recommends that all cages used for handling men shall be equipped with gates, as is already common practice in metal mines and in many coal mines.

(4) The committee further recommends that all shaft landings be equipped with vertical sliding gates not less than six (6) feet high, which shall be opened automatically when the cage stops at the landing, and be closed automatically as soon as the cage leaves the landing, either ascending or descending.

(5) It is recommended that a standard system of signals for hoisting and lowering be adopted by all mines, said code to be based on the codes now most generally in use, except where state laws specifically require otherwise.

(6) The committee recommends that loading booms shall be counterweighed, and shall also be provided with such safety devices as will eliminate danger from dropping through breakage of supporting cable, or when not in use.

(7) The subject of Standardization of sizes of shafting and pedestals being already under consideration by the American Society of Mechanical Engineers, it is recommended that this Committee confer with the corresponding committee of the American Society of Mechanical Engineers and make joint report at a later date.

(8) It is recommended that during the coming year, this Committee work out standard belt and gear combinations in

connection with drives for tipple machinery, such as picking tables, shaker screens, jigs, inclined conveyors, etc. with the object of reducing the number of sizes of such items.

(9) In conclusion, it is recommended that during the next year, the forthcoming publication of the U. S. Bureau of Mines, the hand books of the U. S. Steel Corp., the Safety Standards of the National Council, and of the various Coal Mine Rating Bureaus, and any others obtainable, be jointly digested by this committee, unified, and presented as representing standard practice in the matter of Safeguarding Machinery. Belts, and Shafting, Railings, Toeboards, Stairways, Ladders, etc.

Respectfully submitted,

Henry M. Payne, Chairman.
G. F. Osler,
W. A. Bishop,
F. W. Whiteside,
Jas. Needham,
F. G. Morris,
W. J. Patterson,
M. A. Kendall,
Warren R. Roberts,
Rudolph H. Kudlich.
Hubb Bell, Representative
American Society for Testing
Materials.

CHAIRMAN ROBERTS: This is a very brief report, but is composed entirely of good recommendations. I don't know whether you can keep all of these in your minds or not, for there are nine recommendations but you likely have some particular thought that it has brought to your mind. If there are any of these recommendations that you want to question or add to, we are ready to hear from you.

MR. CASEMAN (New Mexico): I have the same thought that was raised in connection with the other report. The gentleman made the statement that three-fourths of the signals used in the United States were the same signals. I would suggest that that code be incorporated in this report, so that when it goes out over the country we will not only know that three-fourths of the people of the United States are using those signals, but that we will also know what those signals are.

In our state I do not think we have a law on that subject, but I think the State Coal Mining Inspector has issued instructions on the subject. If ours are at variance with those that are conformed to by a majority of the people, we would know it when we get this report.

DR. PAYNE: In that connection, Mr. Chairman, I could say that we wanted to do that very thing. Unfortunately, as Chairman of the Committee, I have been out of the United States for the last two months and just returned. I suppose that is really one reason why we were unable to use some of the data that has been carried over.

I said three-fourths; perhaps it is five-eighths—I don't know just what proportion—but certainly a majority of the states do have standard signals. We came to that conclusion from the fact that you and I all know that whether we go into Illinois, or Kansas or the State of Washington or West Virginia, it is the exception when the hoisting or lowering signal on the cage is not the same as we use at home.

We know that the great rank and file do use those signals. I believe it would be a little unjust, however, and possibly somewhat prejudicial to the uniform adoption of those if we were, at this stage of the game, to come out with an arbitrary statment, "These are the signals you ought to use." I believe it would be conservative judgment for us to let that go a little while until we can get all the state mine laws and digest the matter very thoroughly and make a safe and conservative recommendation.

CHAIRMAN ROBERTS: Is there any further discussion of this paper? We want the very freest of expression regarding all the recommendations made by this Committee.

If there is no further discussion at this time, we will refer this to the Special Joint Committee with the transcript of the discussion.

We will next consider the report of the Committee on "Standardization of Mine Ventilation," of which Mr. Montgomery is Chairman. In his absence his associate, Mr. Trik, who has helped prepare this report, will read the report and lead the discussion. Mr. Trik.

REPORT OF COMMITTEE ON MINE VENTILATION

Owing to the fact that the members of this Committee were distantly located from each other, we found it impossible to get together for a meeting. Our only feasible method, therefore, seemed to be through the medium of a questionnaire. The replies received have been compiled, and having been approved by the members, are made a part of this report.

Since mine fans must be built to meet various conditions found in the mining field, the question of standardization is considered impractical. Your Committee, therefore, have confined our recommendations to improvement and practices of Mine Ventilation which is Standardization in its broader sense and conforms to the instruction issued by the General Committee, knowing that the details of standardization would in due time naturally follow.

It is with these fundamental principles in view that we submit to your Congress the following recommendations with the hope that they will receive your careful consideration:

MINE FAN INSTALLATIONS

Many mines are still ventilated with inefficient fans and furnaces. The loss, due to wasteful power consumption, runs into many thousands of dollars and in spite of this tremendous waste, many operators, apparently unmindful of the great improvements in mining methods, are continuing to install these ancient types of ventilating equipment.

The old wooden housed fans are a source of great danger to those employed in the coal mining industry. The effect of inadequate ventilation has much to do with the health of the miners, the maintenance of the mine and the production of the same. We have had costly warnings during the past few years of the great necessity of utilizing every means to raise the standard of mine ventilation to a higher plane. A good supply of

fresh air in a mine is very essential and no money expended brings better returns than the expenditure in establishing and maintaining a first class system of ventilation. It is therefore recommended:

EXPLOSION DOORS

That all mine fans at gaseous mines shall be so set as to be out of the direct path of an explosion, and that explosion doors be provided for the relief of pressure prior to its reaching the ventilating mechanism.

AUXILIARY DRIVE

That at all gaseous and large shaft mines under heavy cover and without the benefit of additional openings at points on the outcrop, an auxiliary drive be provided.

TEMPORARY FANS

That if a temporary fan is installed at a new mine, it should be so located that the installation of the permanent fan will not interfere with the ventilation.

PRESSURE GAUGES

That all fan installations be equipped with a regular "U" tube water gauge and a recording gauge.

DOUBLE INLET

That double inlet fans are recommended for all fan installations unless local conditions or ventilating factors make such installations impractical.

EVASEE CHIMNEY

That all fans used as exhaust shall be provided with evasee chimneys, so arranged that the air will be discharged vertically.

FIRE PROOF

That all fans be made fire proof. No combustible material should be used in the installations.

OUTLET VELOCITY

That the pressure due to the outlet velocity into the open atmosphere shall not exceed 7½ per cent of the water gauge against which the fan is working.

INTAKE VELOCITY

That the pressure due to the velocity into the inlet of the fan shall not exceed 7½ per cent of the water gauge against which the fan is working.

REVERSING

That all fans for gaseous and large non-gaseous mines be so constructed that the air may be readily reversed.

KNOWN CONDITIONS

That the air shall not be reversed under any circumstances unless conditions inside of the mine are thoroughly known.

FAN CAPACITY

That at mines where the ultimate volume of air to be circulated is approximately or definitely known, or at mines which have reached their development, fans should not be installed with a capacity of two or three times the need or capacity of the mine. On the other hand we do not recommend small fans which must be run at a high speed simply to produce a great depression to draw the air through themselves, see headings: "Intake and Outlet Velocity."

TYPE OF MOTOR

That where moderate to large fans are electrically driven, a slip ring motor should be used. Starting duty on a fan is severe and with the use of a slip ring motor, it can be accelerated gradually which is impossible with a squirrel cage type.

POWER SOURCE

That wherever possible the driving power for the auxiliary equipment should be from a different source than that for the main drive, especially so if electric drives are employed.

BELT CENTERS

That where belt driven fans are used the distance between centers shall not be less than three times the sum of the pulley diameters.

BOOSTER FANS

The Committee has given very careful consideration to the installation of booster fans in mines. It recognizes that much prejudice exists against the use of booster fans but we believe this is due to a lack of knowledge in regard to the function or application. This type of fan is used very extensively in foreign countries; in fact, the ventilation of mines in some countries is so difficult that it is really impractical to get along without booster fans. Our mines are much more easily ventilated in general, but we do find the development of some mines which calls for a booster fan to properly ventilate a remote section without increasing the total ventilating pressure on all splits. It is not our purpose to endorse this type of fan simply to remedy a clogged air way or water filled entry which should be taken care of by other means.

In order to illustrate this very important point let us assume that the fan on the outside has a normal capacity of 80,000 cu. ft. at a certain speed and the mine is divided into four districts or splits which require 20,000 cu. ft. each. Now the resistance

in one long remote split is such that only 10,000 cu. ft. will pass at the pressure necessary for 20,000 cu. ft. in other splits or districts. Here is where a booster fan is practical, economical and recommended. The pressure can be raised on this split and the 20,000 cu. ft. circulated without increasing pressure on the other districts or increasing the speed of the fan on the outside.

If an attempt had been made to properly ventilate this remote split by increasing the speed of the main fan, it would have required double the present fan speed, placing regulators on the other three splits and delivering the 80,000 cu. ft. against four times the present pressure, therefore increasing the power consumption at least four fold or more. The following recommendations are proposed for the booster fan:

INSTALLATION

That they are recommended for use in mines to properly ventilate a remote district which cannot be ventilated by the outside fan without greatly increasing the fan speed.

FIRE PROOF

That the fan installation be made absolutely fire proof and the brattice between the intake and discharge of the fan be constructed of noncombustible material.

BY PASS

That a by-pass door be constructed in the brattice of ample size to permit the air to pass without passing through the fan. This door should always swing in direction of air current.

SELF STARTING

That the motor driving the fan be fitted with an automatic starter totally enclosed in steel box.

CENTRIFUGAL BOOSTER

That where a booster fan is necessary in a mine, usually considerable pressure is required, therefore, a centrifugal type is best adapted.

AIR WAYS

The relation borne by the mine resistance as expressed in inches of water to the power bills for driving the ventilating apparatus is generally well understood by the operator and yet well in the face of this knowledge we are constantly finding an apparent utter disregard of this important fact.

It is no uncommon thing to find a large mine whose development has not progressed beyond three years requiring a 2 inch pressure to pass 100,000 cu. ft. through it. No better indication could be had that the operator's main object was to get a large tonnage and everything else has gone by the board to that end,

and for this neglect of his airways he is bound to pay dearly in the future. If a mine only three years old requires a 2 inch pressure to ventilate it one can readily see what the pressure requirements would be as its life grows longer, the volume required becomes greater, and the air courses are held in the same disregard.

It is the duty of the mine Superintendent, Foreman and Inspector to keep a watchful eye upon the mine resistance and in the interest of good ventilation and economy see to it that all airways be as large and kept as clean as possible.

We feel that this disregard for an important fact is due not so much to willful neglect as to a mistaken idea on the part of the operator as to the apparatus used to ventilate the mine. Briefly, many operators believe it cheaper to let their air courses become clogged and dirty and purchase a new fan when more air is needed. But this is absolutely a misconception of the characteristics of a fan. For be it known that no fan—no matter what its size or make—can deliver more air into the mine at the given pressure than the old ones.

The mine resistance or water gauge is a characteristic of the mine and is in no way governed by or has anything to do with the fan whose sole duty is to run at the proper speed necessary to produce the pressure and volume as called for by the mine characteristics.

The following table clearly emphasizes the importance of maintaining large airways at all times during the life of the mine.

FORMULA—POWER VARIES AS: $\frac{\text{CUBE OF AREA}}{\text{PERIMETER}}$

Size of Airway	Perimeter	Area	Relative Powers making Airway 10x10=10 H.P.	Cost per H.P. per year at 1½c K. W. H.
10x10	40	100	10	$ 980.00
8x8	32	64	30.5	2,989.00
7x7	28	49	59.5	5,381.00
6x6	24	36	128.5	12,600.00
5x5	20	25	320	31,360.00

It will be noted from above table that if it requires ten H. P. for an airway of one hundred square feet it will require about six times this amount for an airway one half this size. The average mine requires about 90 H. P. for its ventilation. Assume the area of the airways as doubled, then about 15 H. P. would be required effecting the saving of 75 H. P.

The system of splitting the air is not carried out extensively as it should be. There are many mines today in which the current is carried in one continuous column from the intake to the outlet. This system is not only very difficult and expensive to maintain, but is a dangerous practice. In case of an explosion the whole mine would be endangered, but if the mine were ven-

tilated, in districts, the effects of the explosion most likely would be confined to a small part of the workings. The splits should be made as near the intake and the several branches reunited as near the outlet as possible.

The proper distribution of the air through the workings requires a thorough knowledge of the subject. There are few matters connected with the mining industry that require greater skill and ability than the proper coursing of the air. A very slight oversight in the distribution of the air may make all the difference between good and defective ventilation. This important work should be placed in the hands of experienced men who are backed up by a certain amount of scientific knowledge on the subject. They should be conversant with the composition of gases, the laws which govern the flow of fluids, and a practical knowledge of the operation of the mine fan is indispensable. Therefore, the recommendations for airways are as follows:

STRAIGHT AIRWAYS

That all airways be driven straight and where changes in direction are necessary that they may be made wherever possible by long radius curves.

EASEMENT

That an easement be provided at the bottom of the fan air shaft to enable a change of direction with a minimum of shock.

CLEAN AIRWAYS

That all airways be kept clean and free from the accumulation of falls, mine cars, timbers, as far as it is found practicable to do so.

OVERCASTS

That where overcasts are used in the airways the bridge be of such size that velocity will not exceed 1000 ft. and that an easement be provided on each side of the bridge.

AIR SPLITS

That in the interest of both safety and economy, the air be divided into several splits rather than forced to travel in one continuous current and that each split shall have not less than 20,000 cu. ft. of air in any mine which has gas that exceeds 0.5 per cent.

STOPPINGS

That all stoppings be made air tight as far as found practical to do so. Should be built of fire proof and durable material and frequently inspected. Piling of gob against stoppings should be avoided as it prevents inspection.

OLD WORKINGS

That the air shall not pass thru old workings, giving off gas, to new workings. Air passing out thru old workings must be of sufficient volume to keep temperature of gob at a safe point.

REMOTE OPENINGS

That as far as practical to do so, the air should be brought in or discharged from openings remote from the fan.

MULTIPLE ENTRIES

That where the size of the mine requires it, the multiple entry system should be used.

CROSS CUTS

That a change in the laws governing cross cuts be enacted permitting main entries which must be maintained thruout the life of the mine, to be driven two hundred feet or more before a cross cut is made. The ventilation of these entries to be accomplished by means of small auxiliary fans and air current carried to the face thru tubing or by brattice lines.

This method will insure a copious supply at the face at all times, reduce the cost of making numerous cuts and building stoppings, prevent a vast amount of air leakage and short circuiting and in turn greatly reduce the volume of air the permanent fan must handle with a corresponding decrease in power consumption.

AIR SPLITS

That the engineer when laying out the mine, shall wherever possible have the splits made close to the intake and bring them together again as close as possible to the outlet.

INLET AND OUTLET

That there should be as free and unobstructed inlet and outlet for the air as far as it is found practical to provide same.

MINE TRACKS

That the mine tracks in the main airways leading to the fan should not be removed. The tracks being available, readily permits the airways to be kept clean.

WATER GAUGE

That the water gauge should be kept as low as possible, but the airways should never be permitted to get into a condition to require over 3 inch gauge to properly ventilate any mine.

AIR VELOCITIES

The question of airways and air velocities are practically indivisible, inasmuch as the velocity of the flow of air is entirely dependent upon the size and condition of the airways.

It is sectional area alone which governs the velocity of the flow of air. A certain airway may be clean and free from obstruction, yet their sectional area may be so small as to cause such a high velocity that the consequent increase in frictional resistances causes the fan to generate a head that is entirely too great for the volume passing and so represents a true loss in power consumption.

High velocities not only cause a useless consumption of power, but other more important results are caused by this unsatisfactory condition. It will be found in mines having high velocities in the airways that unhealthy and dangerous conditions exist at the face of the workings. This is due to the fact that the air carries in suspension the dangerous dust particles in great quantities at high velocity than at a slower velocity, and these are carried back to the live workings. It is also noted that during the winter months when the intake is on the haulage, a high velocity greatly aggravates working conditions. It is therefore, recommended as follows:

MAIN ENTRIES

That the velocity in the main entries shall not exceed 800 ft. per minute.

WORKING FACES

That the velocity at face of the working shall not exceed 300 ft. per minute.

SHAFT OR DRIFT

That the velocity pressure in the air shaft or mine drift shall not exceed 7½% of the water gauge against which the fan is working.

GENERAL

There are other factors which enter into the ventilation of mines for which your committee has not made recommendations due to the fact they are governed by local conditions and do not apply in general to the ventilation in different coal fields. As for example the use of blowing or exhaust fans. Each system has its advantages and disadvantages and the committee feels its duty to point out these and leave it up to the operator to apply the system best adapted for these particular requirements.

The exhaust system has its advantages and some very distinct ones. The haulage road where most of the travel is done is kept free from gas and smoke and permits the men to perform their work in fresh air. The stoppage of the fan will not permit the gas from the gob to find its way to the mine workings, for the mine pressure is increased. One of the main advantages claimed for the exhaust system is it will clear the mine of gas much quicker than a blowing fan. In case of old mines where a blow-

ing fan required from four to six hours to clear the mine of gas, when the fan had been stopped only twenty-four hours, it is claimed with an exhaust fan the mine could have been cleared of gas so that the fire boss could have gone in and made an examination, in less than an hour. The reason for this is the blowing fan carries the gas out of all the old workings and pillar falls, etc., onto the main haulway, while with the exhaust fan all the gas from the mine's old workings, pillar falls, etc., go directly to the airways leading to the fan. Almost as soon as the exhaust fan is started, the fire boss can follow the fresh air into the face of the mine workings. There is also an advantage for the exhaust fan in case of explosion. It enables you to proceed with rescue work with greater dispatch, that is, the intake is on the haulage road which affords easy means to convey brattice material to repair stoppings, etc.

The exhaust system has its disadvantages. There is usually more or less broken coal, and dust in a shaft tipple and scattered along the haulage road and with the intake on the haulage road—these particles are carried back to the live workings which is not only a source of danger but makes the air more unhealthy. The intake air cannot be heated and humidified as conveniently with exhaust system as with the blowing system, without the use of doors on the haulage road. If doors are used then there is more or less fog produced which greatly interferes with the haulage system as men could only see a short distance ahead. The cold air in the winter would have a tendency to freeze up the hoisting shafts or intakes, and also make it very uncomfortable for the men working near the intake.

The blowing fan has a distinct advantage relative to protection of the mine during the winter. If the air is sufficiently heated, that is, if its temperature is brought up to mine temperature, the ventilating current will deposit moisture, wash the air and relieve it of the dust particles which are always present. With a blowing fan the temperature can be kept about the same during the winter as it is in the summer. An even temperature prevents roof-falls and moist mine would prevent mine fires as all combustible material would be kept thoroughly saturated. One advantage the blowing fan has and which is infrequently referred to, is where the mine has not a very heavy strata overlying the coal, and which is broken more or less by drawing pillars and ribs. The blowing fan will force out all contaminated air in these openings, whereas, an exhaust fan will draw it through the mine. There are other advantages for the blowing fan, such as keeping the haulage roads and hoisting shaft free from ice in the winter and more comfortable for the men. If a fire should occur in any part of the mine, it is made evident to the men working in return current.

The blowing fan has also its disadvantages. The gas, smoke

and all impurities travel on the haulage road. Gas has been known to accumulate in a pocket in the roof and cause an explosion on the haulage. If the fan is stopped for any length of time, the pressure on the mine is relieved, that is, with a blowing fan the mine pressure is above atmospheric pressure, and the stoppage of the fan enables the mine to give off gas more rapidly and allows it to find its way out into the live workings.

The method of driving fans is another important subject but it is governed entirely by local conditions, whether steam, electrical or other power is available. If steam is used then the question is whether to use direct connection, belt or rope drivers and this is determined by the volume of air handled and pressure against which it is delivered. In general we might say that where a maximum volume of 100,000 cu. ft. or less is required, delivered against a mine resistance of 3 inch water gauge, it is frequently found advantageous to use rope or belt drive, otherwise it would be necessary to provide a fan of larger diameter and capacity than the mine requirements demand to stay within the safe and economical speed of engine for direct connection.

Where electrical power is used the drive may be a belt, rope, or chain. Direct connection to a motor is only practical where a small volume of air is required and slow speed motor is used unless a reducing gear is provided between the fan and motor. Great care to be exercised in direct connecting fans and motor especially on a new mine where an increase of fan speed is required from time to time.

There are other items relative to the ventilation of mines such as whether to install permanent or temporary fan at a new mine, install permanent or temporary drives, etc., are dependent on factors which at times would call for the adoption on one, at other times to pursue a different course.

CONCLUSION

It is our opinion that a system of educational work should be started relative to the operation and duties performed by mine fans. There appears to be a woeful lack of data and knowledge of the subject. Hundreds of mine fans are condemned by their users as well as by many mine inspectors simply because the mine will not pass the air at a reasonable pressure. The fan may have a normal capacity of 200,000 cu. ft. at 3″ gauge but the mine capacity is only 100,000 cu. ft. at 3″ gauge, hence only 100,000 cu. ft. is obtained at this pressure. The mine acts as a regulator on the fan, therefore no matter how large a duty is specified for the fan only 100,000 cu. ft. is obtained at 3″ gauge.

We do not mean that this educational work should be carried on by the Standardization Committee, but it belongs to the Bureau of Mines. This bureau has done excellent work along most all lines pertaining to the mining industry but we do not

find any educational work pertaining to the operation of mine fans, splitting and distribution of air, size of air ways, shafts, etc.

Respectfully submitted,

W. G. MONTGOMERY, Chairman.
G. E. LYMAN,
E. N. ZERN,
MARTIN J. LIDE,
J. H. DOUGHTY,
H. N. EAVENSON,
J. C. GASKILL,
E. B. WAGNER,
C. E. SHARPLESS,
H. B. WRIGHT.

CHAIRMAN ROBERTS: You have heard the report of the Committee on Mine Ventilation. It must certainly impress you with the vast amount of work that this Committee has necessarily had to do to give you this report.

I happen to know something about mine ventilation myself, having been installing ventilating equipment for some 20 years. In the early stages of my career I used to look around for data that would help to educate me on the proper ventilation of a mine, and I read many of the supposed treatises on the subject, most of which were antiquated, and others that were good theoretically but the men who wrote them knew very little about the ventilation of a mine.

I can truthfully say that all the treatises that I have ever seen on mine ventilation put together didn't have as much good working material to guide a man who wanted to install a proper ventilating system in his name and properly lay out his mine for ventilation as this one paper.

The Committee has tried to lay a great deal of stress upon the fact that the all important thing is to properly lay out your system of ventilation and then maintain it, if you want to economize in the ventilation of your mine.

When I first went into this business some 20 years ago there used to be a great deal of bunk connected with mine ventilation and there were actually in the business at that time some men traveling around the country selling fans who tried to persuade the superintendents and men at the mine that there was a very great deal of mystery and secrecy about the ventilation of a mine and that it just took a certain kind of a fan to ventilate that mine, and that the man who discovered that secret and had that particular fan had a cinch on the business. I know men who were traveling around over the country selling fans on that basis; they had some new kind of a fan that was different from the standard fans that were on the market.

This Committee has drawn the conclusion for you that if a mine is not properly laid out, to take 100,000 feet of air against a three-inch water gauge, no fan can put over 100,000 feet of air through those air ways without going above a three-inch water gauge. I have heard superintendents state that they had a fan that would ventilate any mine. They didn't know the first thing about ventilation and did not know that this fundamental statement was absolutely correct, that no fan could put more air through that air way than it was then getting without raising the water gauge. They thought there was some mystery about it and that their particular fan could do the trick.

While there has been a great improvement due to the higher class men who have been marketing fans and helping to educate the mining

industry in the proper laying out of their mines, there is still a great deal of room for improvement. This report, if it is backed up by the American Mining Congress and given to the industry, will help to put forward a long way the ventilation of mines, and accomplish the two fundamental things—give them the proper amount of air for the men in the mine as a matter of health; and second, produce that air at the least possible cost.

That is the whole thing in the ventilation of a mine.

There are two questions that occur to me, which I would like to ask before we open the discussion. I don't quite understand, myself, what the Committee means by "The remote openings." Explain to the audience what you mean by that statement.

MR. TRIK: You find very often that they have air shafts that are split and the intake is on one side and the air is brought down through one shaft and through the mine and up the other side of the very same shaft into the fan. We mean, as far as practical, if you can get the air shaft on the other side of the mine, then bring it through the mine and to the fan. For instance, in an anthracite mine you will find that the anthracite coal outcrops a great deal. That is a very desirable thing because then you can put your blowing or exhaust fan wherever you choose and use the outcrops as intake for your fresh air.

CHAIRMAN ROBERTS: But in a shaft mine, of course the air will go in one shaft and out the other.

MR. TRIK: Yes. It very often means driving another shaft.

CHAIRMAN ROBERTS: On page twelve you say, "With a blowing fan the temperature can be kept about the same during the winter as in the summer." Explain what you mean by that.

MR. TRIK: You will find very often that operators use exhaust steam. They blow this steam into the air shaft to temper it and in that way the temperature of the fresh air entering the mine is brought nearer to the mine temperature.

CHAIRMAN ROBERTS: You meant then by artificial means?

MR. TRIK: Yes.

CHAIRMAN ROBERTS: Now then, gentlemen, the report is open for discussion. Does any one have any inquiries to make?

MR. J. H. EDWARDS: The report made a recommendation regarding the length of centers for the drive. I think it was three times the sum of the diameter of the pulleys. Well that naturally would rather imply then that that long belt center drive was recommended. I believe that some mention should be made of the success of the short drive with an idler, because some companies that I know of are coming to that drive.

MR. TRIK: Mr. Chairman, I have nothing to say further than that that has been a thumb rule that we have used. We have found that the long centers have been advantageous, but where companies are willing to use an idler there is absolutely no reason for doing it. It is merely a thumb rule that we have used for long centers which are by far in the majority.

CHAIRMAN ROBERTS: You meant that would be the rule where no other means has been used.

MR. TRIK: Do you mean to recommend that an idler can be used?

MR. EDWARDS: Yes, or at least mention it. You ought to mention it.

The people that I am with are operating 24 mines, and practically every one of them has a long belt center drive, and most of those were put in by rule of thumb and conformed to that rule. However, an investigation showed this: due to the belts not being kept at proper tension, due to lack of belt dressing or due to lack of proper pulley, in most cases the drive was very bad, although it did conform to that ruling. As a result of that on the newer mine fans, the larger ones, the idler was resorted to, not only because it was felt that they would have a better

drive for all time, but also the saving in the cost of construction of the building more than paid for the idler.

CHAIRMAN ROBERTS: We might suggest, of course, that an engineer can take into consideration in his original installation (especially of a very high grade equipment for large mines) that, to economize in construction, he may be warranted in putting in a silent chain drive and making his drive very close. There are methods that I think could be inserted that would make that item a little clearer.

Is there any other discussion?

MR. J. A. EDE: One of the difficulties that we experienced in our mine was that the Mine Manager would give us one computation of the air that was traveling and the Mine Inspector would give us another. In order to standardize it, I had standard measurements put in at least two places in the mine, which represented the orifice of the mine and one near the bottom of the shaft. I had that measured carefully so that we could ascertain the extension.

After placing those we never had any more trouble. The inspector would go in and we found a very close relation between the Mine Manager and the Mine Inspector. However, before that, it was different. We are mining on the long wall system; in some cases the opening would be very large, and perhaps the inspector would take it there where perhaps the air didn't appear to be traveling fast and the Mine Manager would take it perhaps in a small place, with the result that there was a discrepancy; but having standardized it, as I have indicated, we have had no further trouble of that kind.

CHAIRMAN ROBERTS: Is there any further discussion of this report?

MR. RUDOLPH KUDLICH: I would like to call the attention of the Committee, when they get to work on this, to the fact that the Power and Transmission Committees have also made some recommendations with respect to the electrical installation of your surface fans, and also covered the auxiliary drive. In some of the mines it is quite difficult to put in the auxiliary drive, and we have given them the alternative of providing signals to warn all the men out of the mine in a very short space of time.

Another question I wished to bring up was in regard to booster fans in the mines. I think it would be well for the Committee to cover the case of booster fans in gaseous mines. The only mention Mr. Trik has made is with reference to closing the starting switch in the steel cabinet. What those recommendations would be I haven't the least idea. I am just offering that as a suggestion.

MR. L. D. VAUGHAN: Mr. Chairman, I think it is an excellent report on ventilation; it is fine, with one exception. Of course when it comes down to the mechanical way of equipping a mine with electricity I know but very little about it, but he does not make mention there of anything but electricity for the power of driving the fan. I think, in gaseous mines, shaft mines, that all the fans should be driven by steam. He does not mention that in his report. For the safety of the mine and the men I think that should be done.

CHAIRMAN ROBERTS: As I remember the report treats that in a negative manner in this way: he does not ignore a steam drive, but he says, negatively, that if electricity is used, then you should do so-and-so, assuming that if you had used steam you did not need to do that, because that is a positive safety appliance.

That was your thought, Mr. Trik?

MR. TRIK: Yes, sir.

MR. L. D. VAUGHAN: If you want to standardize the matter, we should say that fans for all shaft mines should be driven with steam; otherwise some fans in shaft mines would be driven by steam and others by electricity.

MR. TRIK: Then you positively recommend, arbitrarily, that all fans be steam driven?

MR. VAUGHAN: Yes.

MR. TRIK: You would be out of luck in West Virginia.

CHAIRMAN ROBERTS: Possibly these gentlemen don't understand you. Make yourself a little clearer, Mr. Vaughan, as to what mines in particular you think should use steam for the fan drive.

MR. L. D. VAUGHAN: All gaseous mines.

CHAIRMAN ROBERTS: That fans for all gaseous mines should be driven by steam power?

MR. L. D. VAUGHAN: That is my recommendation.

CHAIRMAN ROBERTS: The Committee will take that under consideration.

MR. SIDNEY J. JENNINGS: I would like to point out that there are some coal mines that derive their power from central power stations, either hydro-electric or electricity generated by steam, and they have no steam in their mines at all. It would be an injurious recommendation, under those circumstances, to have a steam-driven fan, and I don't think it should go out as the recommendation of the Committee that any particular form of power should be used, but that a perfectly safe thing should be recommended.

There is one other thing that I would like to bring out. No quantity of air was prescribed or recommended. Several of the states have laws which recommend one volume of air per man per minute, and so many cubic feet per animal. It seems to me that is a point the Committee could take into account; and also in gaseous mines they should take into account the amount of area of coal exposed, which is liable to give off gas and should be considered in determining the amount of air per minute that should go into the mine.

CHAIRMAN ROBERTS: I think those are very good suggestions and the Chairman will be glad to make note of them.

MR. KNIGHT: It has been my understanding, Mr. Chairman, (while I have had no experience really with steam-driven fans myself) that the principal reason for the use of a steam-driven fan was that the supply of electricity, if used, was likely to interrupt. The constant ventilation of the mine was sufficiently important that the reason they desired to use steam was that it was considered a more reliable and constant source of power. That is to say, it was not subject to interruption.

In many cases, even where they have a steam plant, the transmission of steam to the location of the fan may not be economical, and it is my understanding that, in some cases where the matter seems important enough and they want to be absolutely free of interruption, that little separate steam plants have been set up purely for the operation of fans.

CHAIRMAN ROBERTS: That has often been done by men who had not reached the point where they had a lot of faith in electricity. It is gradually coming to the point where we have more faith in electricity. Why? Because the men who have furnished the electrical equipment and the lines, etc., are trying to meet that very requirement because they want electricity used. When I am opening up a mine in a certain locality and electricity is available, we take up with them right away that very question. If they say they can furnish us current for hoisting and ventilating, we want to know all about every detail of the power plant, where their lines go and who takes power from them. Any engineer who is going to depend upon that power to hoist his coal and ventilate his mine will look into that with a great deal of care, and if he is not satisfied, he will put in steam.

The Committee, of course, didn't intend to touch on those things at all. That was up to the engineer installing the equipment. It might be well to have some discussion in the report on such matters. They stuck more to the fundamentals in this first report. This is the report that is to

open up the subject and give it to the industry, and they had purposely and properly stuck to the fundamental things that would guide a man in laying out a properly ventilated mine.

DR. PAYNE: It seems to me we have side-stepped the point which the gentleman brought up about the use of electricity for shaft mines which generate gas. Perhaps I am wrong. However, I infer that his reason for bringing that up was the danger of using electricity. If that was the case and not the question of the steady supply of power from steam, then it seems to me, in the last two or three minutes, we have been side-stepping the real point that he brought up.

If I am correct, in answer to that, it seems to me that electricity at the present time and as recommended by this Committee with the safeguards that they have provided—explosion doors, etc., is just as safe as steam.

CHAIRMAN ROBERTS: Is there any further discussion?

MR. KUDLICH: In regard to Mr. Jennings' suggestion concerning the area of the coal exposed: it occurs to me it would be better, in connection with recommendations where gas is concerned, to make recommendations concerning the maximum amount of methane in the exhaust air from the mine rather than the area of coal exposed. One mine would generate a large amount of gas from a small area of coal exposed, whereas another would generate a very small amount.

CHAIRMAN ROBERTS: The Committee will take that under consideration.

If there is no further discussion, we will close with this paper, and refer it to the Joint Committee together with all of your discussion.

I wish to announce the Committee on Resolutions that was authorized at the forenoon session. With the permission of these gentlemen, I would like to name the following on our Resolutions Committee: Mr. Kudlich, Mr. Trik and Mr. Lee. Will those gentlemen kindly serve on that Committee? They will receive and consider any resolutions that are handed in in writing, so that if any member has any resolutions he would like to get through to the general Resolutions Committee of the Convention, please hand them to any one of these three gentlemen and they will take them under advisement and report back to us.

We have one other very fine report on Underground Transportation including three sectional reports from the three sectional committees. It is a big subject and I thought, at this tag end of the day, you would be tired and we had better start in on that fine big report at our next session. I will have to leave now. If it is your wish to go on with this report, I will appoint a Chairman to continue the meeting.

MR. MILLIKEN: While this report is rather long at the same time I don't think it will take a great length of time to present it.

CHAIRMAN ROBERTS: Then I will appoint Col. Milliken as Acting Chairman of the meeting, since he is going to present the report. Remember, Colonel, besides the general report, there are three sectional reports. I have them all here if you want to refer to them. I hope to get back before the meeting adjourns.

At this point Col. Jas. Milliken took the Chair.

ACTING CHAIRMAN MILLIKEN: Gentlemen, this is the report of the Committee on Underground Transportation. I am very sorry indeed that Mr. Watts was not able to attend the convention. Col. Roberts did his utmost to persuade him, and I have taken the matter up with him to the best of my ability. I think he is a good deal like the boy who stood on the burning deck—his father called him and he would not go because he felt his duty so. No doubt Mr. Watts felt it his duty to remain at Berwyn.

This report is really in three sections. The Chairman's report is quite small and after I have read that, I will give you just a synopsis of the sub-committee reports.

REPORT OF THE COMMITTEE ON UNDERGROUND TRANSPORTATION

During this year the committee has continued its activities in the field of its endeavors, with a spirit of great enthusiasm, taking advantage of the experience gained during the work of the previous year, seeking to enlarge and perfect its organization in such a manner as to best enable it to grasp the subjects to be studied in the most efficient manner, and to coordinate its work with other branches of its own organization, as well as with different Bodies and Societies engaged in similar or parallel lines of research.

In the discussion of the 1920 report the National Safety Council expressed a desire to cooperate more closely with the respective Committees of the Coal Mining Branch and I am glad to advise that we were fortunate in being able to secure a member of the National Safety Council as one of our Committee.

Several additional members representing both operators and manufacturers have also been added to our ranks during the present year, and all members have expressed their interest in the work and have given freely of their time and energies to this cause.

We regret to advise the death of Committee member, Mr. C. W. Larson, Engineer, General Electric Company, which occurred in January, 1921. By his death our Committee loses a most faithful and competent worker in the interest of Standardization.

On March 15, 1921, the sixth regular meeting of this Committee was held, at which time it was decided to go forward with the 1921 year's work based upon the recommended features contained in the previous year's report, viz., Track Gauge, Minimum Track Curvature, Wheel Base of Mine Cars and Overall Length of Car Body.

In order that each of the different subjects to be considered might receive thorough and exhaustive consideration it was deemed advisable to subdivide the work among different committees, thereby permitting each subject to receive the detailed attention of experts. The program for the year was therefore arranged to embrace the three subjects, as follows: Mine Locomotives, Mine Tracks and Signals and Design and Construction of Coal Mine Cars, including Safety Appliances.

Mr. Graham Bright, Gen. Engineer, Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., accepted the Chairmanship of the Committee to study Mine Locomotives.

Mr. Fred Norman, Chief Engineer Allegheny River Mining Co., Kittanning, Pa., accepted the Chairmanship of the Committee on Mine Tracks and Signals.

Mr. J. Milliken, Pres. Industrial Car Mfgrs. Institute, 68 Wil-

liam St., New York City, accepted the Chairmanship of the committee on Design and Construction of Coal Mine Cars.

It was later found that the fourth subject, that of Shaft Equipment could be more advantageously handled by the Sub-Committee on Outside Equipment. It was, therefore, dropped from the program of the Committee on Underground Transportation.

On Sept. 8th, 1921, the seventh regular meeting of this Committee was held, a good representation of enthusiastic members and visitors being present. Reports were listened to and discussed, the committee enjoyed a very interesting and beneficial discussion on general subjects pertaining to Standardization.

So far this Committee has met with most hearty cooperation from the operator, the manufacturer and from other Bodies or Societies engaged or interested in this matter of Standardization.

The Committee extends its thanks and appreciation for the assistance and consideration received therefrom. The attached reports submitted by the chairmen of the respective Sub-Committees clearly illustrates the thoroughness and scope of consideration accorded the Subjects.

This entire report is offered as one of progress, and it is earnestly hoped that the work as outlined may be carried forward in the future to the position where its usefulness may become apparent.

Respectfully submitted,

C. E. WATTS, Chairman.
CHARLES M. MEANS,
GRAHAM BRIGHT,
JOSEPH BRYAN,
F. C. COSEO,
D. F. LEPLEY,
E. A. WATTERS,
J. MILLIKEN,
A. H. EHLE,
H. K. PORTER,
FRANK S. BARKS,
FRED NORMAN,
T. A. PARKER.

REPORT OF SUB-COMMITTEE ON MINE LOCOMOTIVES

Mr. Graham Bright, chairman of this sub-committee, advised that while his Committee had been organized and had formulated a program, they had no definite report to offer at this Conference. This Committee, however, will continue this work and hope to have an interesting report to present at our next Conference.

Since the Standardization Conference, Mr. Bright, chairman

of this sub-committee, has taken up this question of Standardization of Mine Locomotives with the Power Club as he thinks they will be vitally interested in this subject. It is expected as soon as the Power Club has had opportunity to consider the matter that a representative committee will then be appointed and it is hoped to formulate a program and work out definite recommendations in the near future.

REPORT OF SUB-COMMITTEE ON DESIGN AND CONSTRUCTION OF MINE CARS INCLUDING SAFETY APPLIANCES

The report of this Committee for the year must be one of progress only, which is due entirely to the unparallel business conditions of the country. The Chairman of the Committee believes that all standardization work of the American Mining Congress should very largely be in the hands of the mine operators. As it is a fact that any standards that are recommended must be acceptable to the mine operators, it is thought that much time will be saved by establishing their direct interests and responsibilities in the questions at the start. It is felt too that manufacturers should be represented on these committees in order that the operators may receive the benefit of their technical knowledge. The following representatives of coal mine operating companies, car builders, and the Bureau of Mines have accepted service on this Sub-committee.

Company	Representative	Title
Consolidation Coal Co.	R. L. Kingsland	Gen. Supt., P. & M. D.
Hockensmith Wheel & Mine Car Co.	W. K. Hansen	Gen. Supt.
Standard Steel Car Co.	H. M. Estabrook	
American Car & Foundry Co.	A. E. Ostrander	C. E.
Berwind-White Coal Mine Co.	C. E. Watts	M. E.
Bureau of Mines	H. M. Motherwell	M. E.
Westmoreland Coal Co.	C. I. Witmer	M. M.
Industrial Car Mfrs. Inst.	J. Milliken	Pres.; CHAIRMAN

The Committee realizes the necessity of correlating its work with that of the Track Committee and Committee on Locomotive Design. It, therefore, approves those features of the report of the Committee on Underground Transportation submitted to the last meeting of the American Mining Congress, covering gauge of track, track curvature, wheel base, and the relation of the length of cars to the wheel base.

There have been spirited discussions relative to the best means of approaching the possibilities of standardizing parts of coal mine cars. The impracticability of establishing definite standards for cars operated in existing mines was well developed and it has been decided that the best results will be accomplished should this Committee make recommendations for some of the

detailed parts of cars rather than to attempt to make definite recommendations covering such things as car lengths, widths, heights, sizes, etc.

It has been decided that specifications for materials, sizes and types of such items as rivets, bolts, car irons, drawbars, bumpers, couplings, etc., could well be standardized; that recommendations governing the sizes of lumber and sheet steel for car bodies could be given; questions of wheels, sizes and types could well be investigated and definite recommendations made.

As a result of these deliberations, the following committees have been appointed and are now actively at work in order that they may at a later date make definite recommendations that can readily be adopted by the Standardization Division.

1. COMMITTEE ON SIZES AND TYPES OF DRAWBARS, BUMPERS AND COUPLINGS.
2. COMMITTEE ON SIZES OF RIVETS, BOLTS AND IRONS FOR BOTH WOOD, STEEL AND COMPOSITE CAR BODIES.
3. COMMITTEE ON SIZES OF LUMBER AND STEEL SHAPES FOR CAR BODIES.
4. COMMITTEE ON WHEELS, who will present definite recommendations leading to standardized diameters, treads and flanges, with definite recommendations covering the length of wheel hubs together with the relations of the hub to the flange of the wheel for both roller and plain bearings for the most generally used sizes of cars.
5. COMMITTEE ON TYPES OF HAND BRAKES.

CHAIRMEN OF COMMITTEES

R. L. Kingsland, General Superintendent, Consolidation Coal Company, Fairmont, W. Va., was appointed Chairman of the Committee on Sizes of Rivets, Bolts and Irons for both Wood, Steel and Composite Car Bodies.

C. K. Witmer, Master Mechanic, Westmoreland Coal Company, Irwin, Pa., was appointed Chairman of the Committee on Wheels.

H. M. Motherwell, Mechanical Engineer, U. S. Bureau of Mines, Pittsburgh, Pa., was appointed Chairman of the Committee on Types of Hand Brakes.

The desirability of having definite specifications to cover the materials used in the construction of mine cars has been well established and the Committee makes the following definite recommendation, that

Specifications of the American Society for Testing Materials

should be adopted as standards for steel plates, bars, shapes and rivets, for gray iron, malleable iron and steel castings, and for bolts and nuts.

A copy of these specifications is attached as part of this report, including a copy of the American Railway Association's Specifications for Bolts and Nuts, which the Chairman recommends adopting until such time as the American Society for Testing Materials shall have completed a specification.

Respectfully submitted,

J. MILLIKEN,

Chairman, Sub-committee on Design and Construction of Coal Mine Cars including Safety Appliances.

The committee editing the reports, discussions, etc., to be printed in this "Bulletin" decided that the expense and delay by including the three sets of specifications referred to in the above report did not warrant their being printed in this edition of the "Standardization Bulletin." They are all standard specifications which it is presumed most engineers are familiar with in general and the purpose of this "Bulletin" being to elicit discussion and criticism of the reports preparatory to their final revision and adoption it is further assumed that those reading the reports would not wish to pass on the details of these specifications but rather on the advisability of adopting these specifications as recommended by this sub-committee.

Should anyone reading this report wish to obtain the specifications and study them in detail they can be procured from the following sources:

"Standard Specifications for Structural Steel for Cars." Serial Designation; A 11-16.

also

"Standard Specifications for Gray-Iron Castings." Serial Designation; A 48-18.

also

"Standard Specifications for Malleable Castings." Serial Designation; A 47-19.

and

"Standard Specifications for Steel Castings." Serial Designation; A 27-16.

may all be procured from the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.

The "Standard Specifications for Bolts and Nuts" referred to in the report of the Sub-Committee may be procured from the American Railway Association, 431 So. Dearborn Street, Chicago, Ill.

Permission having been obtained from the A. S. T. N. and the A. R. A. to use their specifications in this connection we have no doubt they will be very glad to furnish copies of such specifications to those desiring them.

REPORT OF THE SUB-COMMITTEE ON MINE TRACKS AND SIGNALS

PERSONNEL

This sub-committee being appointed at a meeting of your committee at Pittsburgh, Pa., March 15, 1921, with the writer as chairman, and organized by mail with the following members:

Fred Norman, Chief Engr., Allegheny River Mining Co., Kittanning, Pa., Chairman.
I. J. Harvey, Mine Supt., Helvetia, Pa.
John Woodall, Mine Supt., Conifer, Pa.
Arthur White, Mine Supt., Seminole, Pa.
William P. Jones, Mine Supt., Chickasaw, Pa.
Thomas H. Thompson, Mine Inspector, Kittanning, Pa.
W. P. Buckwalter, Manufacturers' Agent, Pittsburgh, Pa.
Charles H. Partington, Chief Engr., Cincinnati Frog and Switch Co., Cincinnati, O.
T. H. Edelblute, Manufacturers' Agent, Pittsburgh, Pa.
J. K. Lansdowne, V. P., Weir Frog Co., Cincinnati, O.
F. W. Holcomb, Weir Frog Co., Cincinnati, O.
A. S. Carr, Manufacturers' Agent, Pittsburgh, Pa.
W. H. Rubbe, Chief Engr., American Frog and Switch Co., Hamilton, O.

HISTORY

Considerable correspondence was carried on between the members and chairman, with a meeting in Pittsburgh, Pa., July 19th, 1921, for a general discussion of the subjects before the committee.

Five members of the sub-committee meeting with your committee on Underground Transportation at call of Chairman, September 7th, at Pittsburgh, Pa.

Track Gauge—The Committee generally concurred in and agreed with the recommendations submitted by your Committee at Denver to adopt 42″ gauge as standard mine track gauge, and our findings are based on this recommendation. From your report at Denver we learn that about 80% of the gauges in use in the U. S. A. are 42″, which is corroborated by our records.

One concern building electrical mine locomotives found 54%-42″ gauge, while one of the Frog and Switch Manufacturers found 37% of their product calling for 42″ gauge. This is exceptional as switch material was sold to many small mines that sprung up during the war, and as a rule adopted narrow gauges for working crop coal under shallow cover, etc., and lessened the percentage of wider gauges temporarily.

The committee, with one or two exceptions, favored 42″; the exceptions, 36″ gauge.

Turnouts—At our July meeting in Pittsburgh your committee concentrated on Turnouts and Switches. The matter of phrase-

ology in designating switch material was discussed, and for the benefit of all concerned in ordering switch material to use a "standard" designation, as follows:

ONE COMPLETE TURNOUT consists of 1 frog, 2 filler rails, 2 switchpoints with bridle or bridles, and slide plates, and 1 switch stand with connecting rod.

ONE COMPLETE SWITCH consists of 2 switchpoints with bridle or bridles and slide plates, and 1 switch stand with connecting rod.

If not all of the material is wanted it can be stated as: One complete turnout without filler rails, etc., or, One complete switch without switch stand, etc.

Curvature—In connection with turnouts we concur also in your Committee's recommendation of a minimum curve of 28′ (thio) radius corresponding to a No. 2 turnout for entering rooms from entry.

For turnouts between room entries and face or panel entries a No. 3 turnout with 63′ (thio) radius, and between face or panel entries and Main haulage entries, a No. 4 turnout with 112′ (thio) radius, giving ample variety to suit the majority of inside conditions. With this in view, the Frog and Switch manufacturers represented on the committee have worked out detail plans of Nos. 2, 3 and 4 turnouts. Covering rail sections from 16 to 60 pounds.

Room Turnouts—It will be noted that the No. 2 turnout consists of 1 No. 2 frog, 2 filler rails, and 1 3′ 0″ or 3′ 6″ split switch with one bridle and four sliding plates. Switch stand not shown on drawing. In many cases switch stands are not used, the switch simply being kicked into position, and the friction of the bridle holding it in place. However, with gathering locomotives a switch stand is desirable.

This Committee favors the No. 2 turnout for rooms, with the only objection that the longer radius curve requires a wider room neck, which is sometimes impracticable in tender roof. In such cases, the rooms can be turned off the entry at an angle of 45° and at a predetermined distance turned an additional 45° to get the room at right angles to the entry, or any other angle desired. This will eliminate any widening of the room neck, besides materially easing the curvature into the room. A drawing showing this arrangement is incorporated with the turnouts submitted. See Figs. 1 to 5 incl. for No. 2 turnout, and Fig. 18 for the "room neck diagram."

No. 3 Turnout—Several drawings of No. 3 turnout, with No. 3 frog and 6′ 0″ split switch with one bridle and four sliding plates covering from 16 to 35 pound rail for fishplate connections, and from 25 to 45 pound rail for angle-bar connections. See Figs. 6 to 12 incl. for No. 3 turnout.

No. 4 Turnout– The drawings covering No. 4 turnouts show

No. 4 frog with 7′ 6″ split switch having 2 bridles and 6 sliding plates, for 40 and 45 pound, and 50 to 60 pound rail sections. See Figs. 13 to 17 incl. for No. 4 turnout.

It is this Committee's opinion that these three turnouts, Nos. 2, 3 and 4, will cover most conditions met with in coal mines, and recommend their adoption as standards in connection with a 42″ gauge of track.

Switch Stands—The matter of switch stands to operate the switches has not yet received the consideration it should have. The consensus of opinion is on "Parallel Throw," but as to the "Upright Lever" or "Ground Lever," the opinions are divided. This Committee therefore is unable to make a recommendation on this subject at present.

Switch Ties and Cross Ties—Sets of switch ties can be worked out for each particular turnout, but as this matter has not yet been considered, have no recommendations to make.

Roadbed, Headings, etc.—The width of entries and the position of the track, etc., varies much in practice. Usually the track is not in the center, but a little to one side of the center line in order to allow for ditching and passageway for men.

Signals—This subject has been discussed to some extent. The Committee agrees that some kind of "Black Signal" system should be introduced in all mines operated with power haulage, but the subject has not yet reached a stage where recommendations can be made.

General—This Committee has concentrated its efforts on turnouts for the present, considering this the first and most important step toward standardization, next to a standard track gauge.

The Committee members have shown real enthusiasm, and the chairman feels that he is under heavy obligations for the valued assistance rendered, especially so to the representatives of the Weir Frog and Switch Company and the Cincinnati Frog and Switch Company, both of Cincinnati, Ohio, who have worked out and prepared the plans and drawings herewith submitted; also to the American Frog and Switch Company, Hamilton, Ohio, and the Ironton Engine Company, Ironton, Ohio, for their able and valuable assistance.

Respectfully submitted.

FRED NORMAN,
Chairman, Sub-committee on
Mine Tracks and Signals.

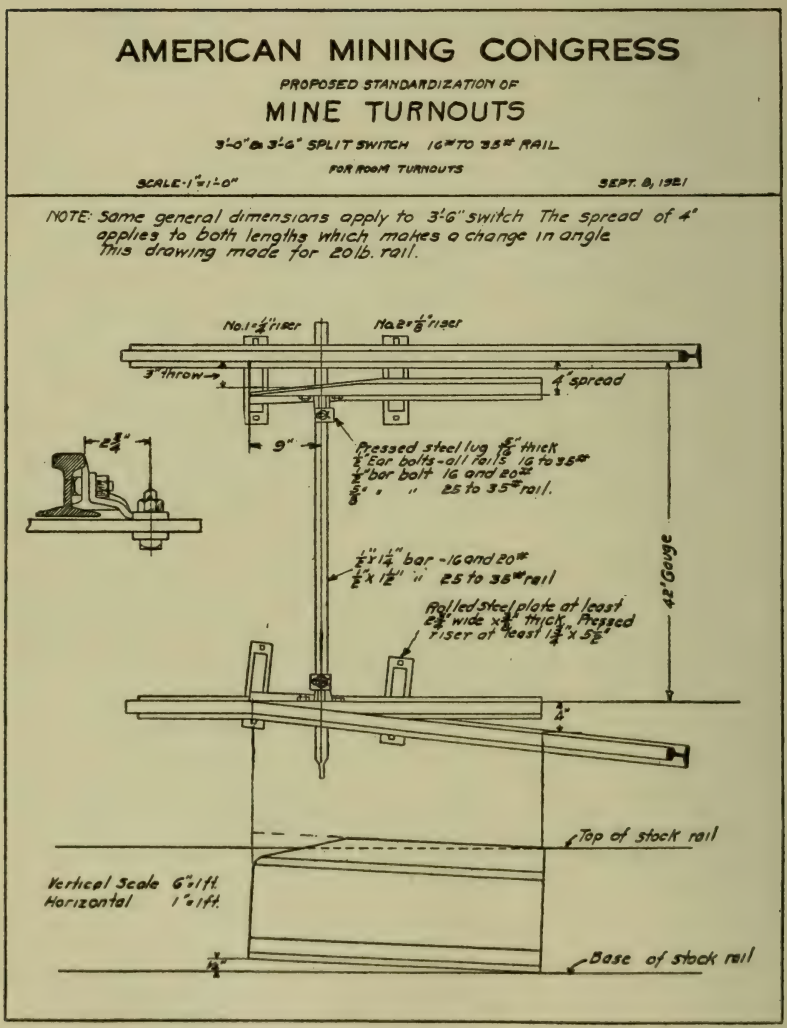

AMERICAN MINING CONGRESS
PROPOSED STANDARDIZATION OF
MINE TURNOUTS
3'-0" & 3'-6" SPLIT SWITCH 16# TO 35# RAIL
FOR ROOM TURNOUTS
SCALE-1"=1'-0"
SEPT. 8, 1921
NOTE: Same general dimensions apply to 3'-6" switch The spread of 4" applies to both lengths which makes a change in angle This drawing made for 20lb. rail.
No.1-1/4" riser
No.2-1/8" riser
3" throw
4" spread
2 3/4"
9"
Pressed steel lug 6" 1/8" thick
1/2" Ear bolts-all rails 16 to 35#
1/2" bar bolt 16 and 20#
5/8" " " 25 to 35# rail.
1/2"x1 1/4" bar -16 and 20#
1/2"x1 1/2" " 25 to 35# rail
Rolled steel plate at least 2 3/4" wide x 1/2" thick Pressed riser at least 1 3/4" x 5 1/2"
4'-2" Gauge
4"
Top of stock rail
Vertical Scale 6" = 1 ft.
Horizontal 1" = 1 ft.
1/4"
Base of stock rail

Fig. 1—No. 2 Turnout.

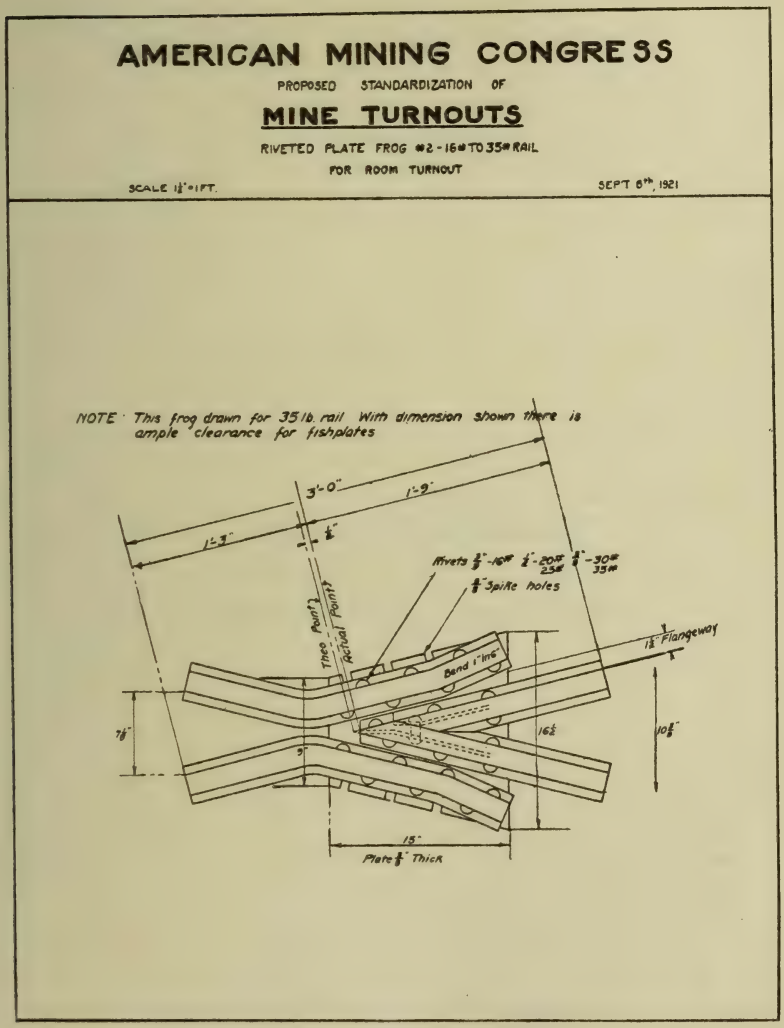


Fig. 2—No. 2 Turnout.

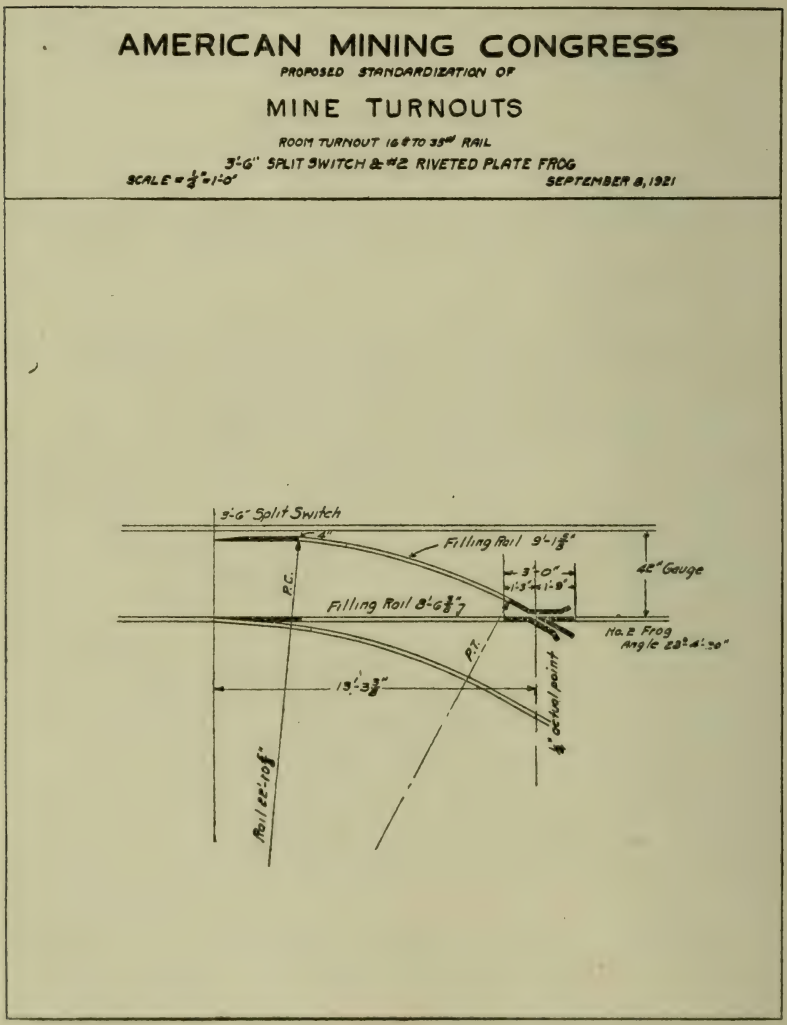


Fig. 3—No. 2 Turnout.

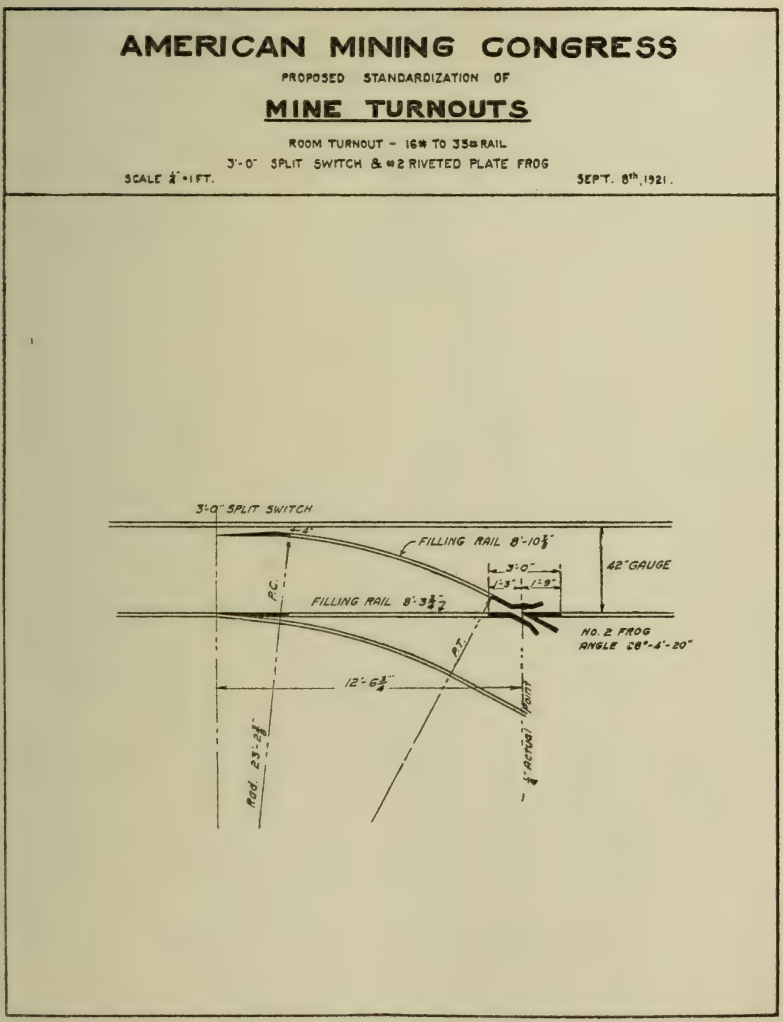


Fig. 4—No. 2 Turnout.

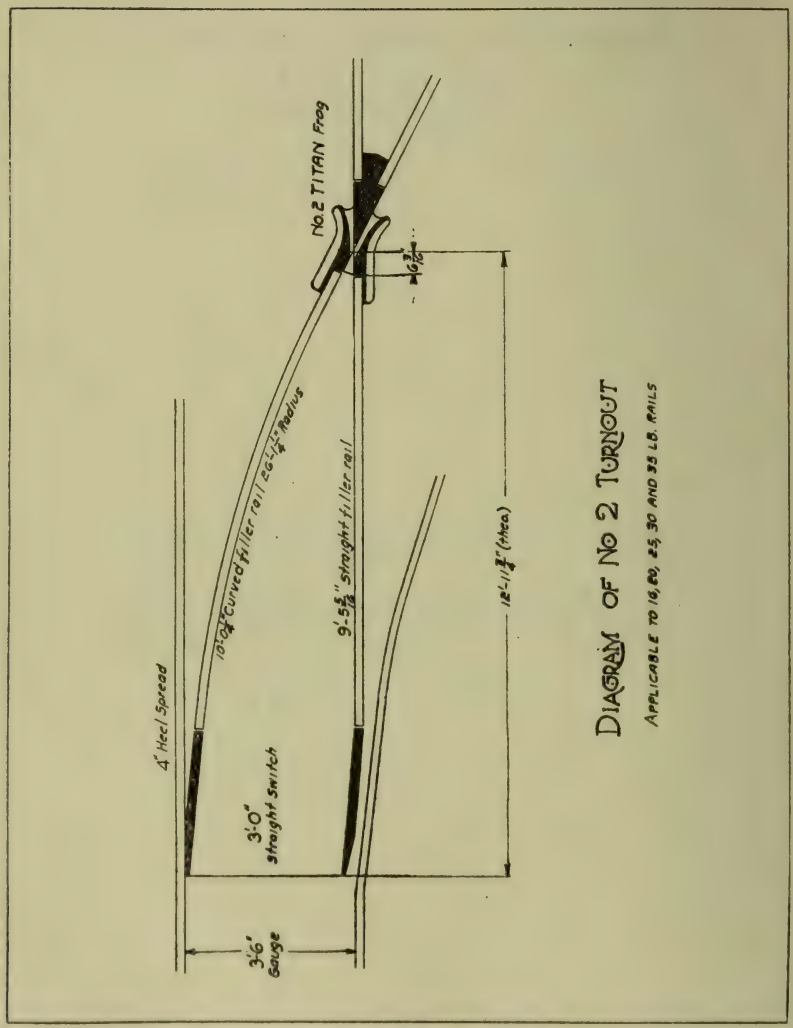

No. 2 TITAN Frog
16½"
10'-0" Curved filler rail 28-1½" Radius
9'-5⅝" Straight filler rail
12'-1¾" (Heel)
4' Heel Spread
3'-0" Straight Switch
3'-6" Gauge
DIAGRAM OF No 2 TURNOUT
APPLICABLE TO 16, 20, 25, 30 AND 35 LB. RAILS

Fig. 5—No. 2 Turnout.

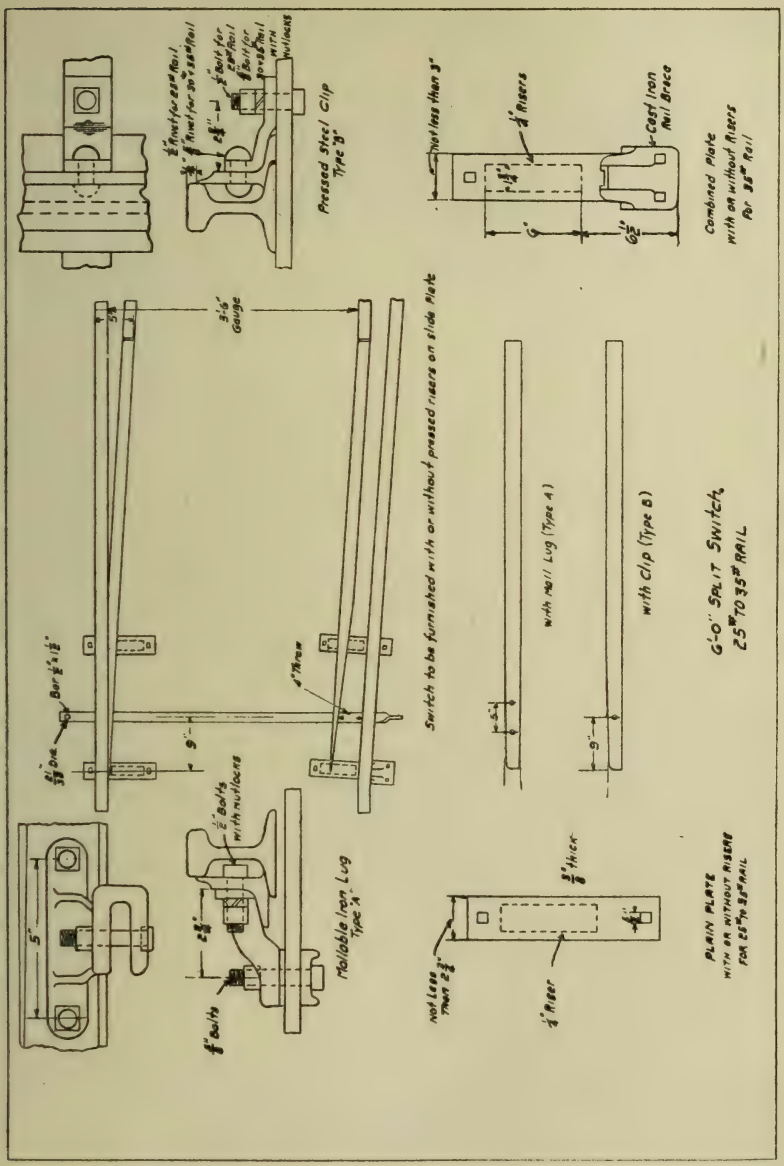


Fig. 6—No. 3 Turnout.

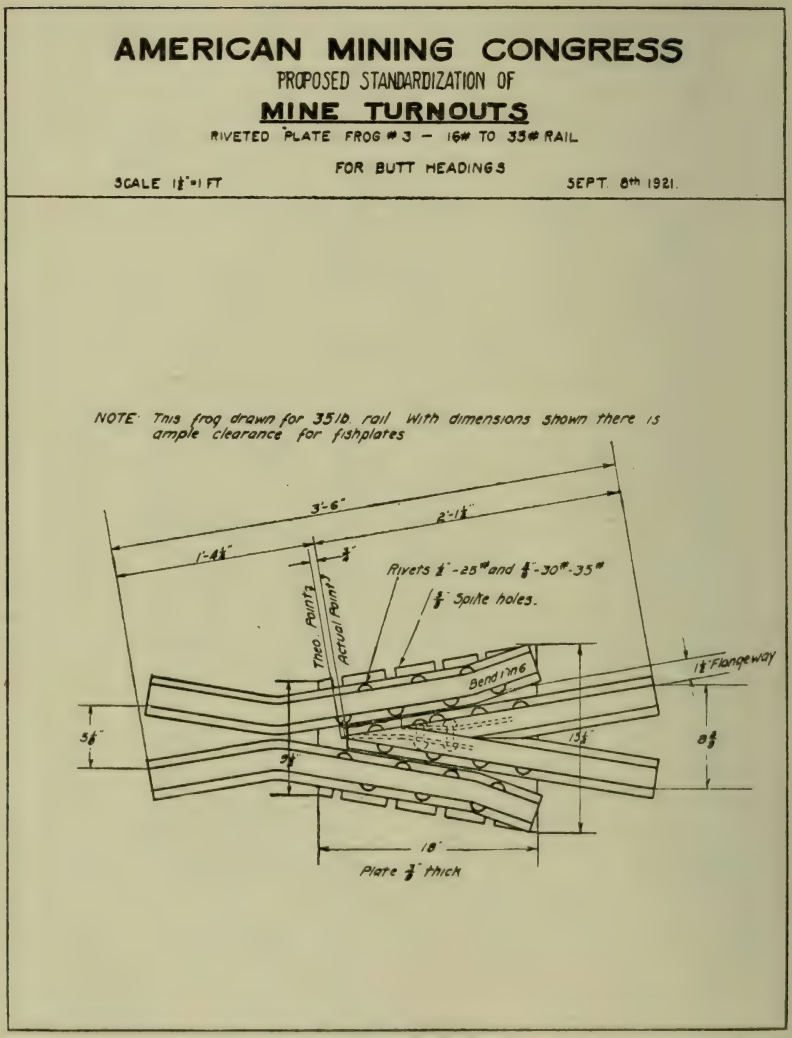


Fig. 7—No. 3 Turnout.

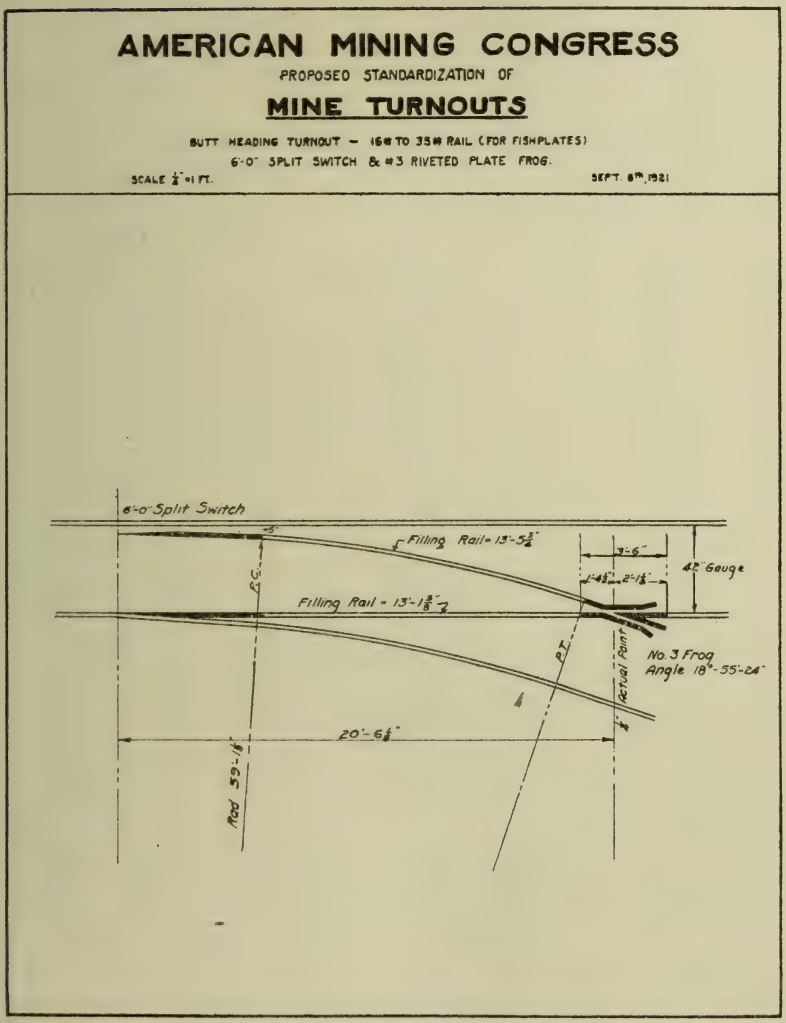


Fig. 8—No. 3 Turnout.

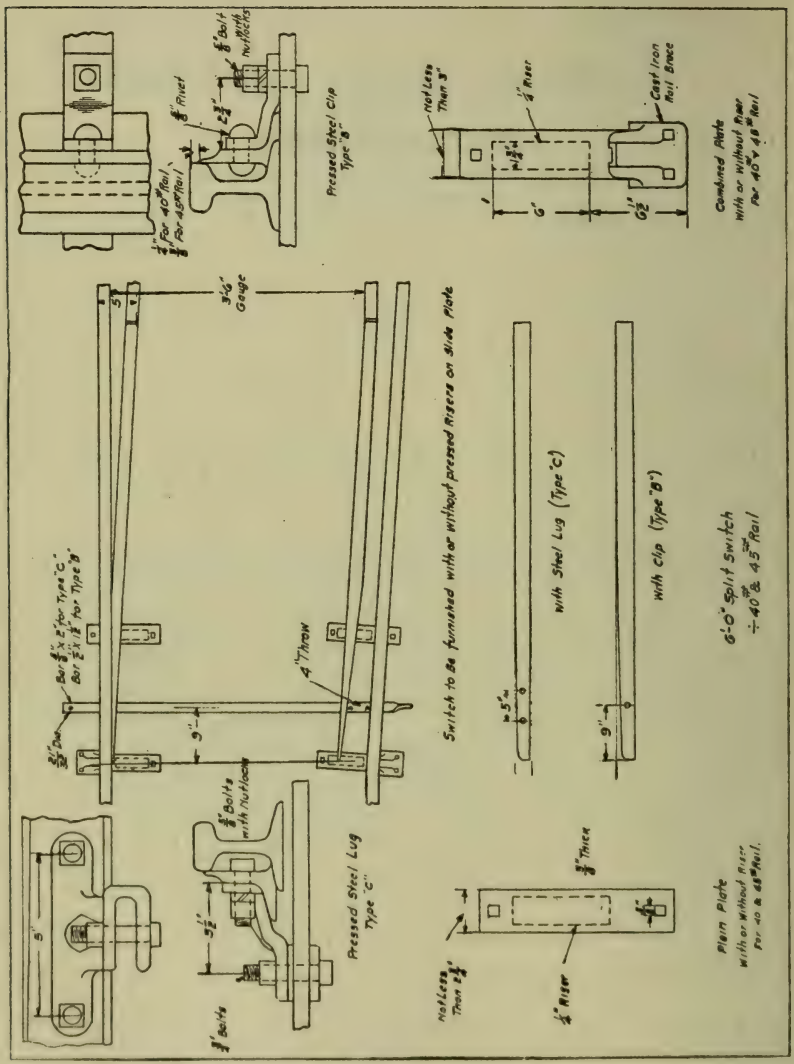

Pressed Steel Clip Type "B"
Not Less Than 3"
4" Riser
Cast Iron Rail Brace
Combined Plate With or Without Riser For 40# & 45# Rail
3'-6" Gauge
Switch to Be furnished with or without pressed Risers on Slide Plate
4" Throw
With Steel Lug (Type 'C')
With Clip (Type 'B')
6'-0" Split Switch For 40# & 45# Rail
Pressed Steel Lug Type "C"
Plain Plate With or Without Riser For 40# & 45# Rail.

Fig. 9—No. 3 Turnout.

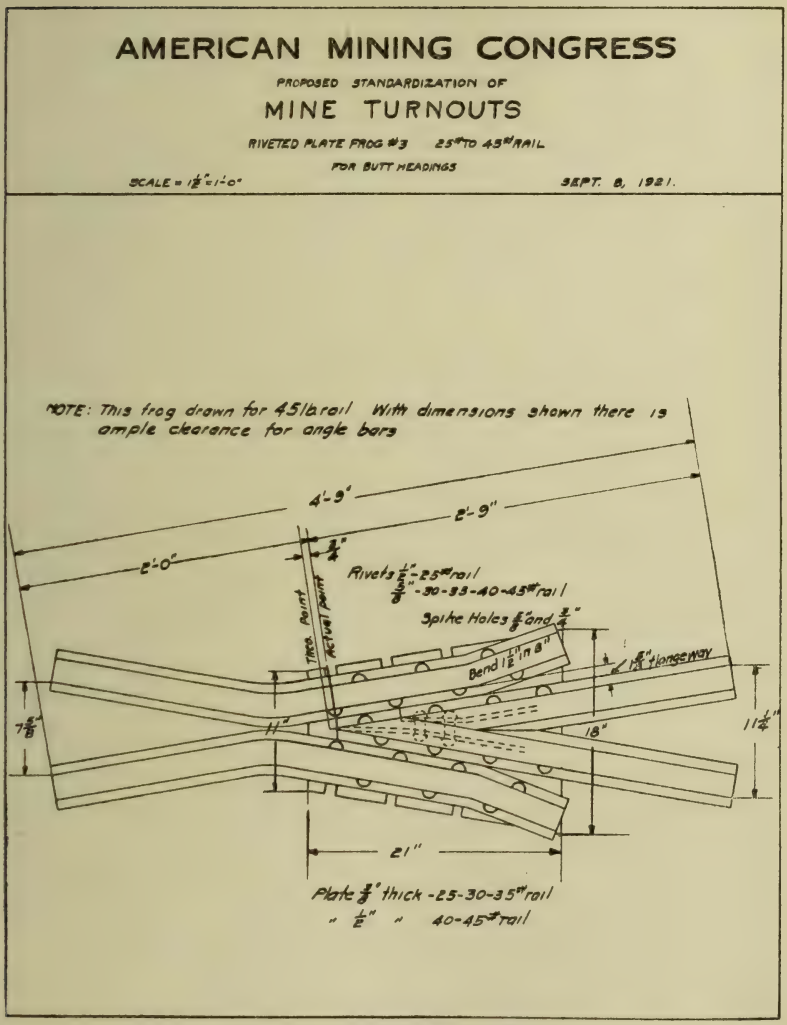


Fig. 10—No. 3 Turnout.

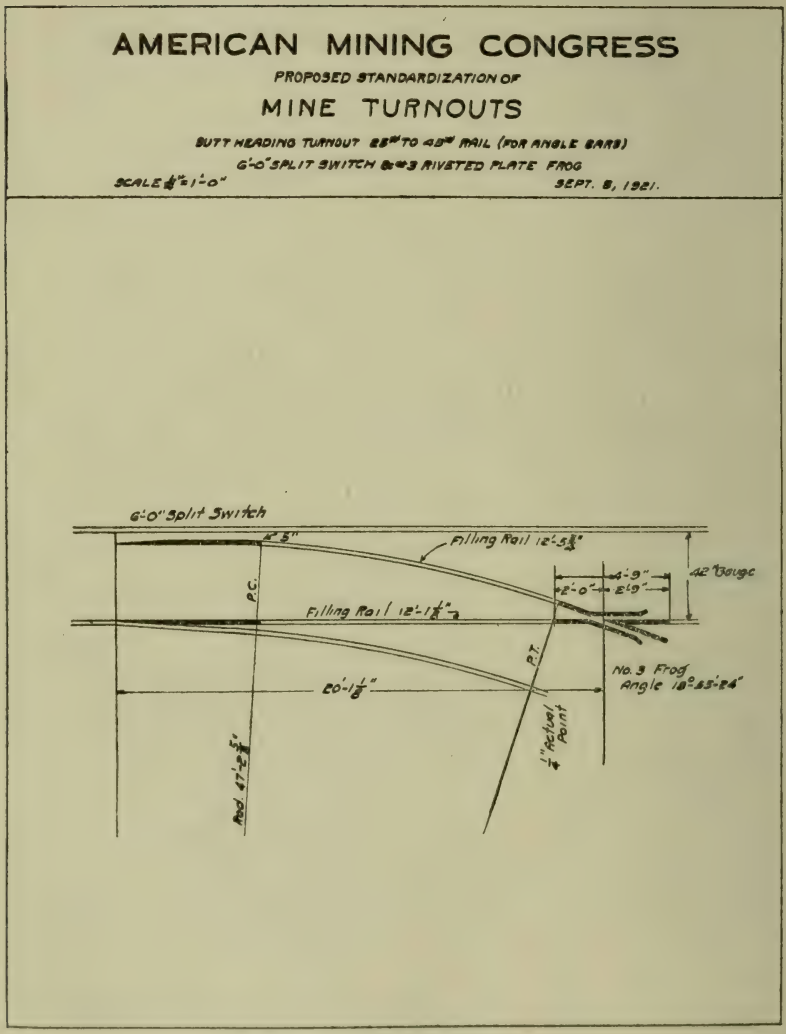


Fig. 11—No. 3 Turnout.

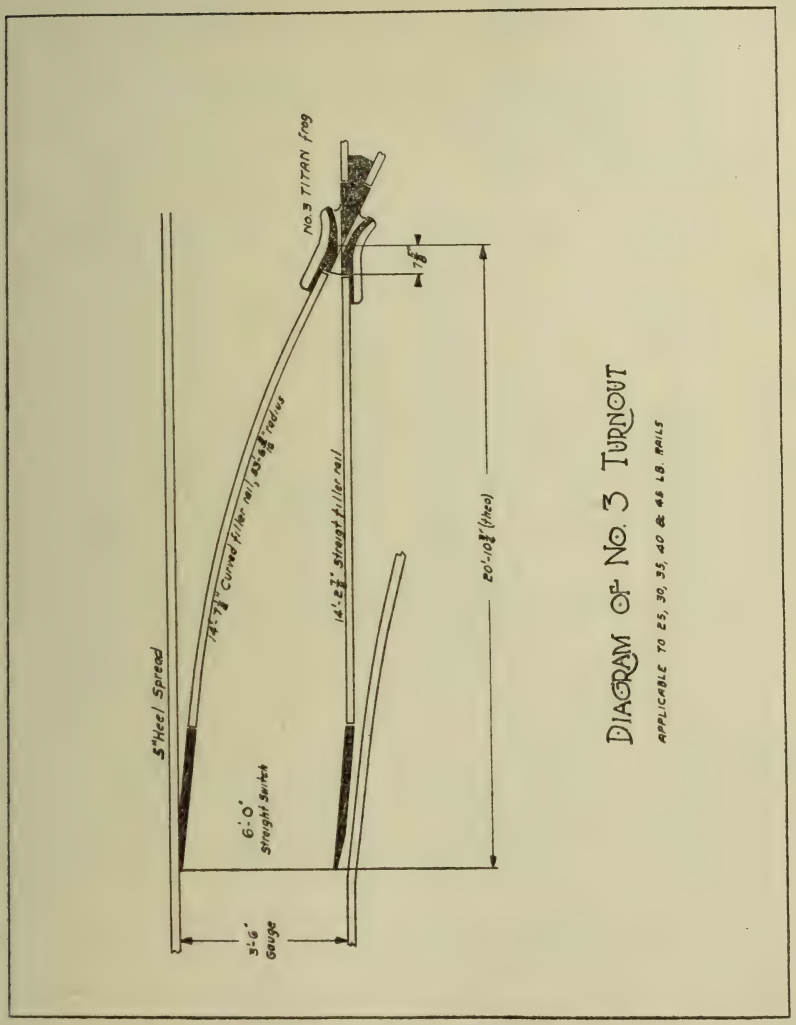

No. 3 TITAN frog
7⅛"
14'-7½" Curved Filler rail, 45'-8½" radius
14'-2½" Straight Filler rail
20'-10¾" (Heel)
5" Heel Spread
6'-0" Straight Switch
3'-6" Gauge
DIAGRAM OF No. 3 TURNOUT
APPLICABLE TO 25, 30, 35, 40 & 45 LB. RAILS

Fig 12—No. 3 Turnout.

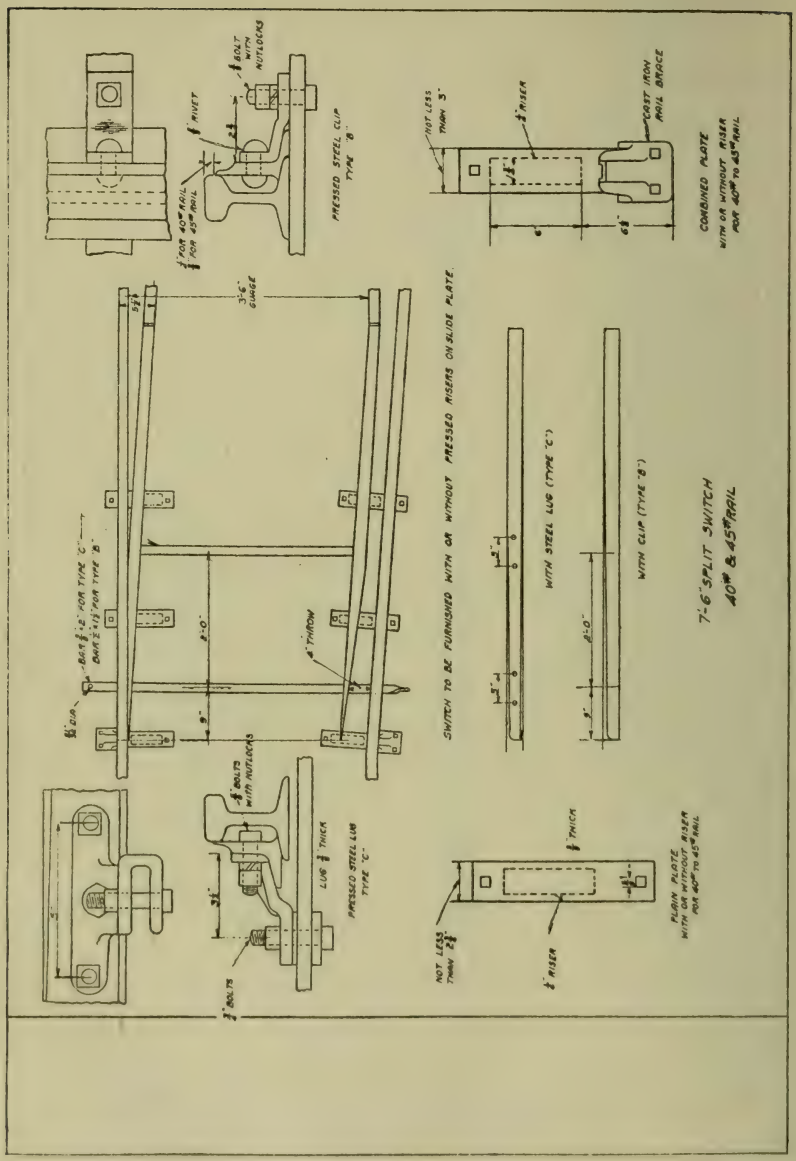

PRESSED STEEL CLIP TYPE 'B'
PRESSED STEEL LUG TYPE 'C'
CAST IRON RAIL BRACE
COMBINED PLATE
WITH STEEL LUG (TYPE 'C')
WITH CLIP (TYPE 'B')
SWITCH TO BE FURNISHED WITH OR WITHOUT PRESSED RISERS ON SLIDE PLATE.
7'-6" SPLIT SWITCH
40# & 45# RAIL
3'-6" GAUGE

Fig. 13—No. 4 Turnout.

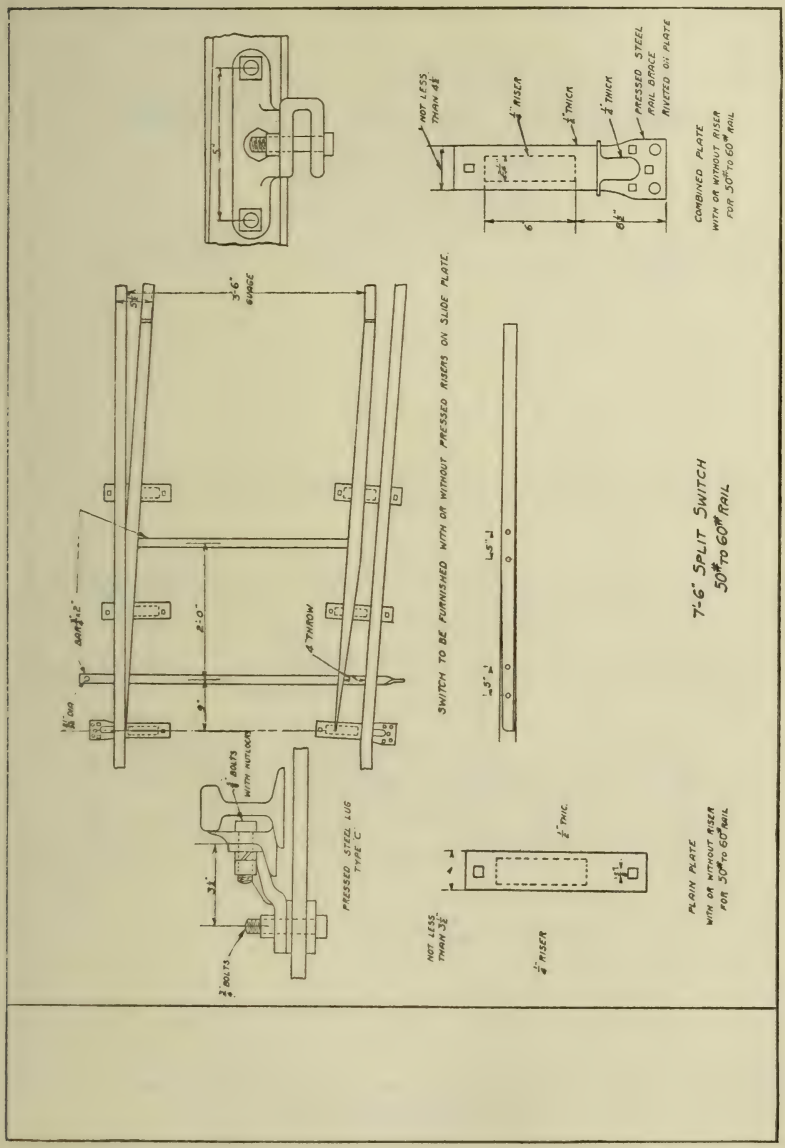

NOT LESS THAN 48"
4" RISER
1" THICK
1" THICK
PRESSED STEEL RAIL BRACE RIVETED ON PLATE
COMBINED PLATE WITH OR WITHOUT RISER FOR 50# TO 60# RAIL
SWITCH TO BE FURNISHED WITH OR WITHOUT PRESSED RISERS ON SLIDE PLATE.
7'-6" SPLIT SWITCH 50# TO 60# RAIL
PRESSED STEEL LUG TYPE C
PLAIN PLATE WITH OR WITHOUT RISER FOR 50# TO 60# RAIL
4" RISER

Fig. 14—No. 4 Turnout.

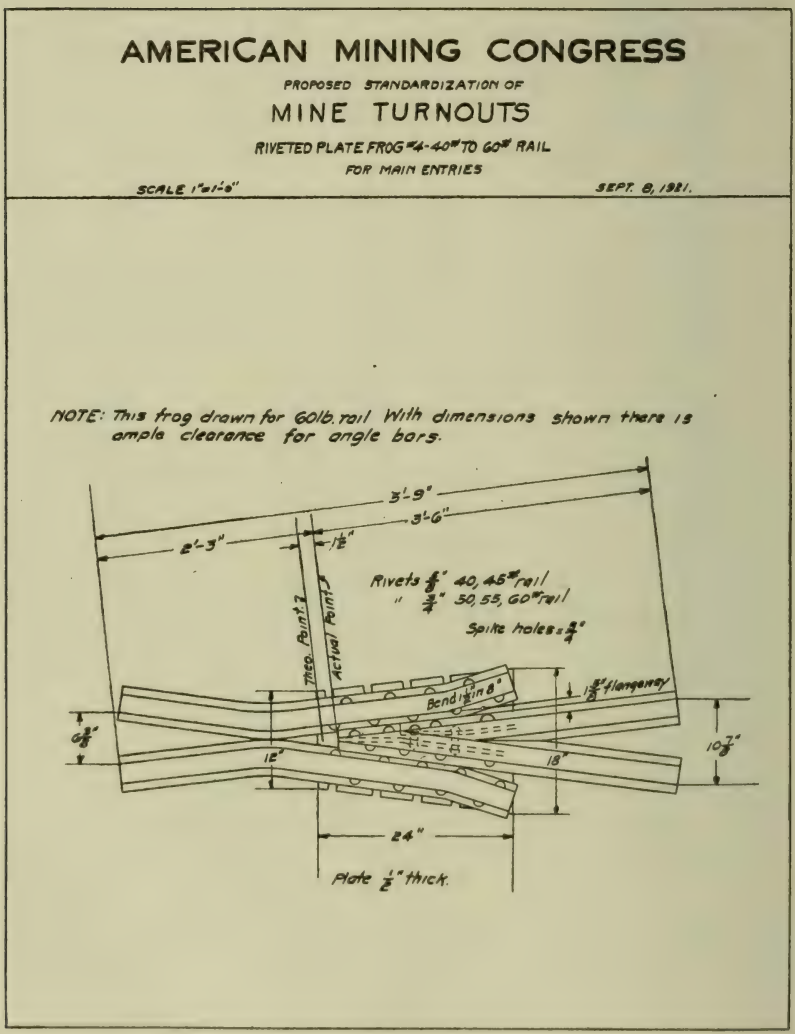


Fig. 15—No. 4 Turnout.

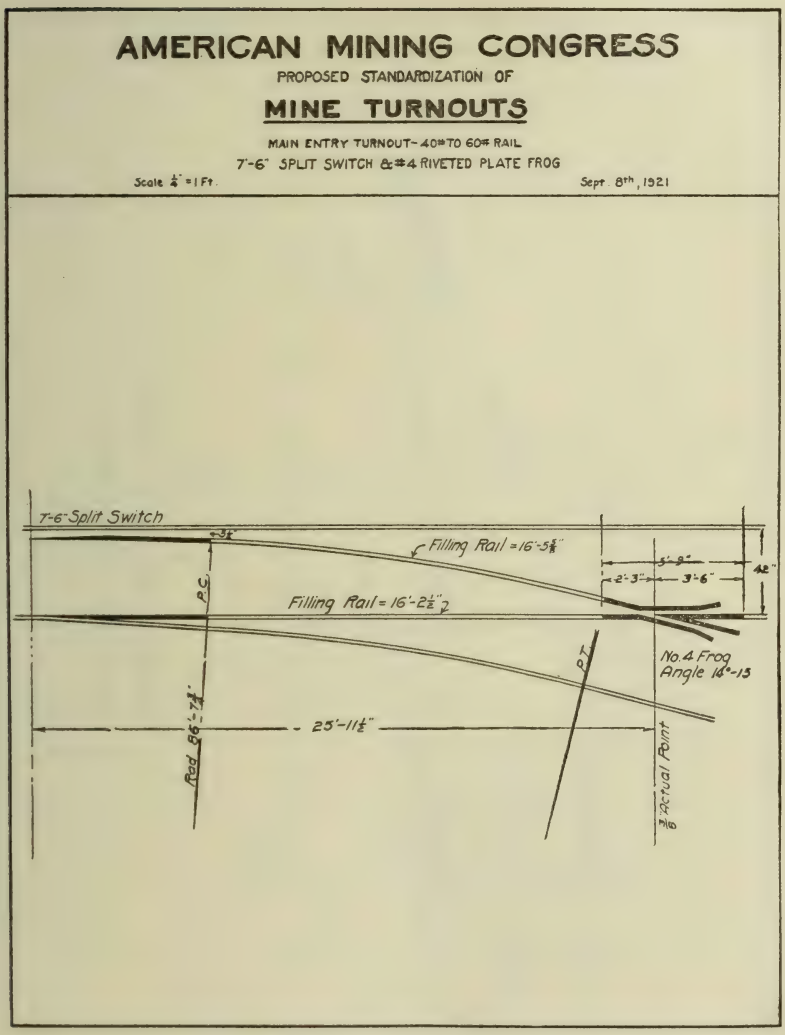


Fig. 16—No. 4 Turnout.

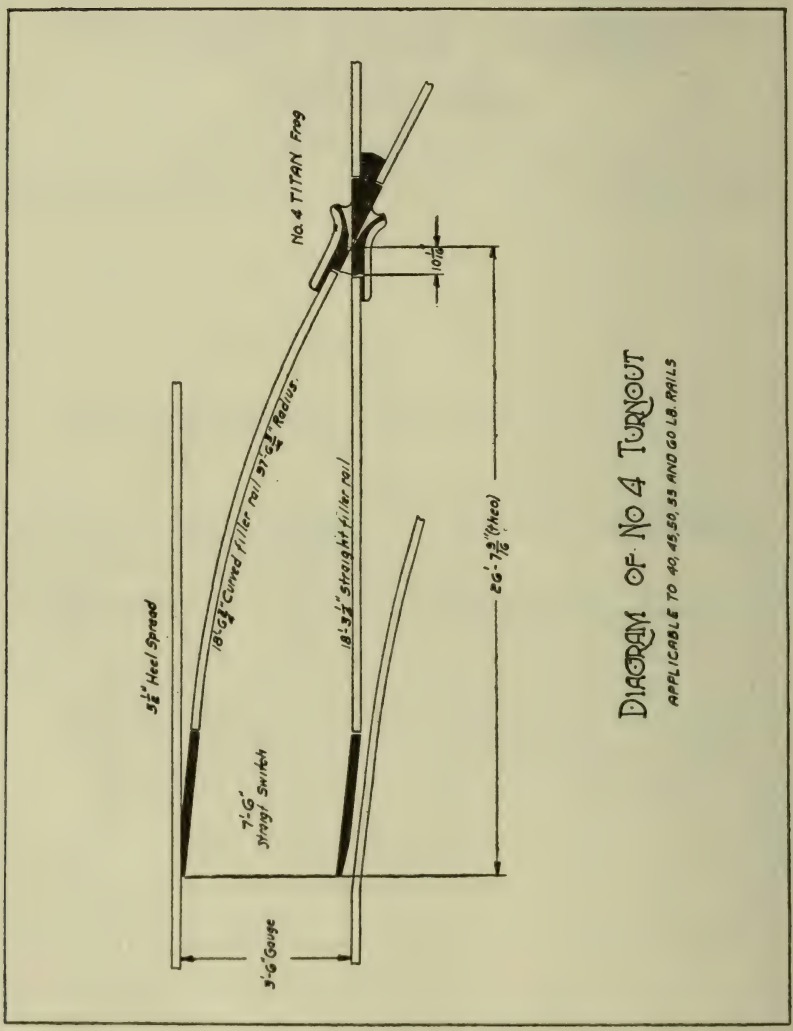

No. 4 TITAN Frog
10½"
18°-6½" Curved filler rail 91'-6½" Radius.
18'-3½" Straight filler rail
26'-7⅛" (Heel)
5½" Heel Spread
7'-6" Straight Switch
5'-6" Gauge
DIAGRAM OF No 4 TURNOUT
APPLICABLE TO 40, 45, 50, 55 AND 60 LB. RAILS

Fig. 17—No. 4 Turnout.

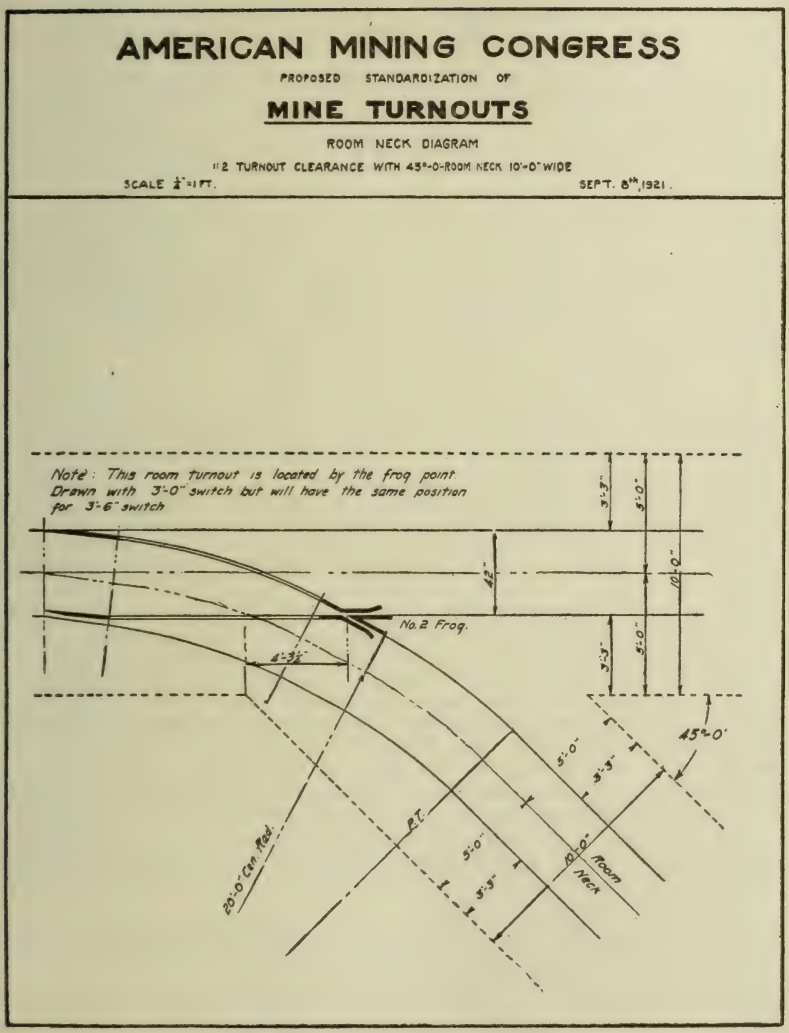


Fig. 18—Room Neck Diagram.

COL. MILLIKEN: Gentlemen, you have heard this report. Mr. Bright's report is simply one of progress, and the only thing that can be done is to accept it as such. You have heard a synopsis of the report of the Committee on Mine Tracks and Signals, and I believe it would be well to have a discussion at the present time on that feature of the report. Possibly Mr. Norman, who is here, will have something to say in addition to what I have read.

MR. NORMAN: I haven't anything to add unless somebody asks some questions.

MR. R. I. WERT: In the standardizing of the gauge and making it 42 inches, I think we ought to take into consideration the size of the vein of coal. While now the thicker veins are being worked, some of the smaller ones are also being worked and as time goes on there will be more of the smaller veins being worked. It is a pretty expensive undertaking to get a 42-inch gauge and leave any drainage ditch on the side.

I realize that a man can haul more coal on a 42-inch gauge track, but with the smaller seams in a great many instances it would not be practical to use the large car bodies, especially where it is a push proposition. Before anything definite is adopted, I think that point should be taken up. In other words, it might be of more advantage to the industry in general if we had two gauges, one for the larger seam and one for the thinner.

MR. NORMAN: You mean two standards?

MR. WERT: Yes.

ACTING CHAIRMAN MILLIKEN: That was considered very carefully, I know, by the Track Committee. I happened to be present at some of their meetings, and as it was brought out in the reports, statistics show that 80 per cent of the tracks that are now being installed in mines are 42-inch gauge. Undoubtedly there will have to be some exceptions to any standards or recommended practices that the Mining Congress may make; but it was the thought of this Committee that they should recommend what is considered the best and most economical track systems for mine operations.

MR. NORMAN: You understand that the 42-inch gauge had been recommended last year at the Denver convention and that the present Committee based their findings on that standard already adopted.

MR. CARL LEE: I think it was discussed at one of the first meetings of the Standardization Committee and that it was practically decided a 42-inch gauge was proper, with the alternative of 6-inch variations over or under for special conditions where they have to get down to 30 and 36-inch gauge, and possibly up to 48-inch gauge.

MR. EDE: I thing that should also apply to long wall work. That is a very large gauge to put in long wall work.

MR. NORMAN: Would it not be optional to have any gauge you would want, even if there was one standard gauge, the same as with a standard gauge railroad?

MR. EDE: Yes.

MR. NORMAN: Inasmuch as 80 per cent of the people use a 42-inch gauge and that is the standard gauge, all other gauges would be special. As it is now they are all special.

MR. EDWARDS: In this discussion I have been thinking of the situation that exists with the company with which I am associated. At present they have 36-inch, 40-inch, 42-inch, 44-inch and 48-inch gauge, and the conditions are the same in all of those mines. The fact was that they purchased mines in which this equipment had already been installed. There is so much equipment that it is practically out of the question to change. However, if when that was installed there had been some standard, such as 42-inch gauge, perhaps all of those would have been 42.

So I think there should be a recommendation for 42 as standard and everything else could be special.

ACTING CHAIRMAN MILLIKEN: I think that was very largely the thought that governed the Committee in making their recommendations. There are all kinds of gauges at the present time, even down to half inches. That is the thing we really want to eliminate, and emphasize the desirability of one gauge of track.

MR. EDE: I think that is absolutely correct for it would save a great deal of expense and enable interchange, which is impossible now. The other day we had an experience with a mine in which there were two different gauges. There is no reason why they should not have been the same. Quite a number of the mines in the northern field have different gauges. I think if there was a standard made for the long wall, as well as for the pillar, it would be beneficial.

ACTING CHAIRMAN MILLIKEN: I am very sure the Committee will give your thought consideration.

MR. KNIGHT: I believe the point that these gentlemen are driving at is simply this: it is simply a repetition of the same point, just as Mr. Edwards has brought out on the 42-inch gauge—in other words, if we set a standard of 42 inches, where that is possible, it would clear up the possibility of having a number of different gauges.

On the other hand, suppose that is the sole recommendation, then we will say that where 42 is not possible, it might be you could use 36 or 24 or 38 or 40, or any other gauge. I think that what these gentlemen are driving at is that there ought to be some definite recommendation, where 42 is not possible, so that under other conditions, you would have a recommendation of a gauge that could be used. Then you should stick to that and not have a number of other gauges where you would be in the position mentioned by Mr. Edwards.

MR. S. W. FARNHAM: From the manufacturers' viewpoint, I can certainly testify to the expense and difficulty of furnishing locomotives for all sorts of gauges. We have had 33 inches, 31 inches, or any odd size that occurred to the man who opened the mine. That was during the time when odd gauges were prevalent.

I agree with Mr. Knight's point, that if you recommend a 42-inch gauge as a standard, which is an excellent standard, I think, and say nothing more, that leaves a man with special conditions free in his own mind to select anything that he might choose. If, on the other hand, you suggested that where the conditions do not permit the use of the recommended standard of 42 inches that he try to select some one of the 6-inch divisions, as pointed out by Mr. Lee—namely, 24 or 30 or 36 or 48—then that will at least reduce the number of possible variations in future operations.

ACTING CHAIRMAN MILLIKEN: Those thoughts, gentlemen, will all be considered by the Joint Committee of the two branches and some definite recommendations will be made later on.

If there are no further remarks on the subject of Tracks, we will go to the question of Car Construction. The definite recommendation there by the Committee is the adoption of specifications for materials, and they have recommended the A. S. T. M. specifications (that is the American Society for Testing Materials) because they are so generally used in not only all car construction but in all metal construction.

The specifications are very clearly written. They are understood by the manufacturers as well as by the buyers, and the Committee is really desirous, if possible, that that recommendation go definitely before the Mining Congress.

I will be very glad to hear any discussion that there is on the report.

MR. O. J. KEYES: I would like to ask if the Committee who has charge of the specifications on wheels and bearings is going to make a definite recommendation as to the wheelbase of a pit car as regards the length. You will find that most of us have had that experience, especially where you have got two or three lots of pit cars in one mine, that there is a different wheelbase quite often.

I believe that the Committee should give their opinion in a case, for instance, where a pit car has a total length of 120 inches, as to what the wheelbase of that particular car should be. I think that would be a valuable thing.

ACTING CHAIRMAN MILLIKEN: There is a Committee that is now giving that subject consideration.

If there is no further discussion, this report will be referred to the Joint Committee and taken up later on.

Unless some gentleman here has something further to bring up, we will declare this meeting adjourned.

Thereupon the meeting adjourned at 5:20 p. m.

COAL MINING BRANCH

Tuesday, October 18, 1921, 2:30 P. M.

The meeting convened at 2:45 p. m., Colonel Warren R. Roberts presiding.

CHAIRMAN ROBERTS: Since Mr. Pauly, the Chairman of our Committee on Power Equipment, and his Committee have not arrived, I want to refer back to some of the uncompleted business of yesterday. You will remember that we appointed a Joint Special Committee representing both the Metal and Coal Mining Branches to receive and coordinate all reports. While we are waiting for Mr. Pauly, we will ask for a progress report by that Committee. Our representatives were Colonel Milliken and Mr. Knight, and the Metal representatives were Mr. Daly and Mr. Notman. Colonel Milliken will report.

COLONEL MILLIKEN: Mr. Chairman, I have a report here and just as soon as I can get the other two members to sign it, we will be able to dispose of it finally.

CHAIRMAN ROBERTS: Very well. We will take up another report. I would like to inquire whether our Committee on Resolutions has received any resolutions from any members of the Conference.

MR. KUDLICH: We have not received any resolutions up to the present time.

COLONEL ROBERTS: We have three other committees to hear from and Mr. Pauly, Chairman of the Committee on Power Equipment is with us, and while he has no report, I would like very much to have him make a verbal statement to you as to the status of his work. It has been referred to, Mr. Pauly, briefly in my general report, but I think you should make a statement with reference to the work.

MR. PAULY: Last year we met jointly with the Committee on Power Transmission and took as a basis for our work the technical paper number one hundred thirty-eight of the Bureau of Mines and attempted to bring that up to date. That done, it seemed to us best to defer further action on our part until such time as that report could be printed and circulated broadcast among as many of the mining engineers as possible, and upon whatever criticisms or suggestions were offered by them to take further action.

Note: The following is last year's report mentioned by Mr. Pauly, which it was thought best should be inserted in this Bulletin.

JOINT REPORT OF COMMITTEES ON UNDER-GROUND POWER TRANSMISSION AND POWER EQUIPMENT

In considering the problem of standardization, we have divided it into two parts: the standardization of equipment, and the standardization of practice in the installation and operation of equipment.

As the Electric Power Club has for its object the standardization of the capacities, voltages, speeds and essential mechanical features of electric motors, generators, transformers, etc., and as its standards are the accepted standards throughout the country, it was suggested that we adopt them as our standards of equipment. It was also suggested that the Standardization

Rules of the A. I. E. E. be adopted as our standards of technical matters.

With the standardization of equipment disposed of we devoted our time and attention to the standardization of practice. This field has been very thoroughly covered by the Bureau of Mines in its technical paper No. 138, entitled, "Suggested Rules for Installing and Using Electrical Equipment in Bituminous Coal Mines," and these were taken as the basis of our work. Each rule was thoroughly discussed and revised where it seemed advisable to do so for the purpose of clarifying it or of making it conform to present day practice.

We, therefore, submit the following as the joint recommendations of the Sub-committees on Underground Power Transmission and on Power Equipment.

That the standards of the Electric Power Club be adopted to our standards of electrical equipment:

That the Standardization Rules of the A. I. E. E. be adopted as our technical standards;

That the following rules be adopted as our standards of practice in the installation and operation of transmission and power equipment.

BASIS OF THE RULES

Five basic measures for safeguarding the use of electricity in mines are as follows:

1. Remove the contributory causes of accidents or danger.
2. Remove from the vicinity of electrical apparatus all elements susceptible to the influence of electricity.
3. Keep the electric current where it belongs, if possible. If not, limit the area of its activity by protective devices.
4. Use a large factor of safety in the selection, installation, and inspection of equipment.
5. Have full control of the movements of electrically driven machines.

Each rule that is given in this report is proposed as necessary or helpful to the accomplishment of one or more of these measures.

DEFINITIONS OF TERMS USED

The meanings of some of the terms and expressions as used in this report are defined below in order to avoid confusion.

ALIVE. See definition of "live."

APPROVED. The term "approved" means accepted as suitable by a competent committee, board, or organization designated by those adopting the rules.

AUTHORIZED PERSON. The term "authorized person" means a person appointed or permitted by the official designated by the State mining laws as the one in charge of the operation of the mine to carry out certain duties incident to the generation, transformation, and distribution or use of electric energy in the mine, such person being one who is competent within the purpose of the rule in which the term is used.

ELECTRIC SYSTEM. The term "electric system" means all electric apparatus pertaining to the operation of the mine and under the control of the mine officials that is connected electrically to a common source of voltage or that is installed so that it can be thus connected.

GROUNDED CIRCUIT. The term "grounded circuit" means a circuit that is permanently grounded at one or more points.

GROUNDING. The term "grounding," as applied to any object used in connection with a permanently grounded electric system means connecting such object to the earth in such a way that a path of low resistance is provided between the object and the permanently grounded point of the system. A connection to a thoroughly bonded rail is an example of a good ground connection.

The term "grounding," as applied to any object used in connection with an electric system that is not provided with a permanent ground means making a connection to the general mass of earth in such a manner as will insure at all times an immediate discharge of electrical energy without danger.

GROUND RETURN. The term "ground return" means that part of a circuit which is the earth, or metallic conductors intimately associated with the earth, and which is practically at earth potential at all points.

LIVE. The word "live" means electrically connected to a source of voltage difference or electrically charged so as to have a voltage different from that of the earth.

PERMISSIBLE EQUIPMENT. "Permissible equipment" refers to any equipment that is listed with the U. S. Bureau of Mines as permissible for use in such places as containing gas or coal dust in explosive mixtures.

PORTABLE ELECTRIC LAMPS. Portable electric lamps are electric lamps that while lighted may be carried about. This general term includes lamps operated by batteries and lamps connected to a source of power by a flexible conductor whose length limits the range over which the lamp may be used.

SELF-CONTAINED PORTABLE ELECTRIC LAMPS. Self-contained portable electric lamps are electric lamps that are operated by an electric battery that is designed to be carried about by the user of the lamp.

PORTABLE MOTORS. The term "portable motors" means motors that are intended for service here and there as occasion requires and that are so constructed or mounted as to facilitate moving them from place to place.

STATIONARY MOTORS. All motors not included in the class of portable motors shall be considered stationary motors.

POTENTIAL. The words "potential" and "voltage" are synonymous, and mean electrical pressure.

DIFFERENCE OF POTENTIAL. The expression "difference of potential" means the difference in electrical pressure existing between any two points in an electrical system or between any point of such a system and the earth, as determined by a voltmeter.

POTENTIAL OF A CIRCUIT. The potential or voltage of a circuit, machine, or any piece of electrical apparatus means the voltage normally existing between the conductors of such circuit or the terminals of such machine or apparatus. In alternating current systems the voltage of the system shall be that indicated by a voltmeter.

(a) Any voltage less than 301 volts shall be deemed a low voltage.

(b) Any voltage greater than 301 volts but less than 651 volts shall be deemed a medium voltage.

(c) Any voltage in excess of 651 volts shall be deemed a high voltage.

PROTECTED. The word "protected" as applied to the current-carrying parts of an electric system is taken to mean that accidental contact with such parts is prevented by approved guards.

SHOCK-PROOF. The term "shock-proof" as applied to the current-carrying parts of an electric system (excepting trolley wires) is taken to mean that contact with such parts is prevented by the use of grounded metallic coverings or sheaths.

GENERATING STATION. The term "generating station" means a station in which electric generators are operated by prime movers.

SUBSTATION. The term "substation" means a station in which the current is changed in character, or voltage.

UNDERGROUND STATION. The term "underground station" means an underground place in which there are installed transformers, switchboards, or electrical machines other than portable motors, or any one of them.

SWITCHBOARD. The term "switchboard" means the essential mounting common to several pieces of switch gear or controlling appliances.

VOLTAGE.—See definition of "potential."

DIVISION 1.—GENERAL RULES

MAN IN CHARGE OF ELECTRICAL EQUIPMENT

1. At each mine where electricity is used underground there shall be in charge of the electrical equipment a man fitted for his position by ability, training and experience. The character of the equipment will determine the qualifications of the mine electrician, and he shall be thoroughly familiar with the operation and maintenance of the equipment under his charge.

PERSONS WORKING ON ELECTRICAL EQUIPMENT

2. No person shall be allowed to work on or with electrical equipment of any kind unless he has been previously instructed by an authorized person in the performance of his duties.

CONSTRUCTION AND RATING OF APPARATUS AND RELATION OF CAPACITY TO DUTY

3. All electrical equipment shall be rated in accordance with the current-standardization rules of the American Institute of Electrical Engineers.

4. The rating of each piece of electrical equipment shall be stamped on it or inscribed on a metal plate suitably mounted and maintained upon the equipment. The inscription on the plate shall indicate whether the rating is for continuous or intermittent service and shall be in accordance with the nameplate requirements of the American Institute of Electrical Engineers.

5. All equipment shall be operated within its rated capacity as defined by the standardization rules of the American Institute of Electrical Engineers.

PERMISSIBLE VOLTAGES

6. High voltages may be used for transmission purposes underground, provided that such circuits are carried inside metallic sheaths or coverings with the sheath or covering permanently grounded. This voltage may be applied only to transformers or to motors in which the high voltage windings

are a part of the stationary element. Medium or low voltage may be applied to all electrical equipment.

MECHANICAL CONSTRUCTION OF INSTALLATION

7. Care shall be taken to insure good mechanical construction and neat workmanship in connection with all wiring and the installation of equipment.

PREVENTION OF ACCIDENTAL CONTACT

8. Space shall be provided for free movement where regular passing is required or permitted around all unprotected parts of the electric system, and places where persons must pass close to or adjust permanently installed electrical machinery shall be sufficiently lighted.

9. The standing room around all electrical equipment shall be kept as dry as practicable. At any place where it is necessary to manipulate or adjust medium or high voltage live equipment, including switches, motor starters, and other controlling appliances, excepting locomotives and machines that are moved so frequently that they are provided with trailing cables, there shall be provided and available an insulated platform or mat which may be of a form and character most in keeping with the circumstances of its use, and which shall be not less effective than a dry board 3 feet by 15 inches by ⅞ inch.

10. All metallic frames, casings and coverings, except those of mining machines and drills, that may become alive, shall be permanently grounded.* All metallic pipe lines, 1,000 feet or over in the interior of the mine, and all pipe lines leading outside shall be bounded to the return at ends and at intervals not exceeding 500 feet. All metallic pipes in shafts shall be bounded to the return at top and bottom of shafts.

11. Where danger exists of accidental contact with wires carrying electric current the wiring shall be protected. In haulage roads used as traveling ways the wires need not be protected, if a traveling way of approved dimensions is provided on the side of the entry opposite from the wires. Where wires are run in an entry in which no one but authorized persons are allowed to travel, or where no hazard from contact exists, the wires need not be protected.

12. Weatherproof varnished cloth, rubber, or similar insulation, unless inclosed in a metallic sheath, when used underground will not be considered as a protection against shock.

---

*It is assumed that the ordinary conditions of operation of locomotives fulfill the requirement of this rule.

13. In untraveled places where the roof is likely to fall all electrical conductors shall be especially protected from injury by falling roof.

CARRYING CAPACITY OF CONDUCTORS

14. The carrying capacity of insulated conductors of distributing circuits shall be determined by reference to the table of carrying capacities laid down in the National Electric Code.

The carrying capacity of bare conductors shall be determined by reference to Table 1, following:

Table—Current-carrying capacity of bare copper conductors used in mines:

Size of conductor B. & S. gage	Current capacity Amperes	Size of conductor Circular mills	Current capacity Amperes	Size of conductor Circular mills	Current capacity Amperes
10	80	250,000	690	750,000	1,520
8	105	300,000	790	800,000	1,590
6	145	350,000	880	850,000	1,660
4	210	400,000	965	900,000	1,730
2	280	450,000	1,050	950,000	1,800
1	320	500,000	1,140	1,000,000	1,870
0	375	550,000	1,215		
00	435	600.000	1,285		
000	525	650,000	1,370		
0000	615	700,000	1,450		

USE OF PERMISSIBLE EQUIPMENT

15. The decision as to where and when permissible equipment is required will be made from time to time as necessary by the properly constituted State authority. The term equipment as here used includes anything in the electric circuit.

See also rules 14, 112, 124, 132, 136, 138, 140, 141, 144 and 164.

INSPECTION AND MAINTENANCE

16. At each mine where electricity is used underground a systematic inspection of all wiring and equipment shall be made at regular intervals, at least once every month. A report of each inspection shall be made by the mine electrician or inspector and a copy of this report shall be furnished to the man legally in charge of the operation of the mine and kept on file at the mine. The report shall definitely state the condition of each underground station, of the conductors and controlling appliances of each main and branch, power and lighting circuit, and of the motors and controlling appliances of each locomotive, mining machine, pump, hoist, or other piece of electrical apparatus connected to the electrical system of the mine.

NOTICES AND WARNINGS

17. Caution notices shall be posted at points where such warnings will be most effective in reducing the likelihood of contact, and prohibitory notices shall be posted wherever electrical apparatus that should not be manipulated by unauthorized persons is installed.

INSTRUCTION FOR RESUSCITATION

18. There shall be posted prominently in every surface and underground station, and at the entrance to the mine, instructions for the restoration of persons suffering from electric shock.

All employees who work with or on electrical apparatus must know how to carry out these instructions without delay.

PLAN MAP OF ELECTRICAL SYSTEM

19. A plan shall be kept at the mine showing the location of all permanently installed electrical machinery and apparatus in connection with the mine electrical system, including cables, conductors, lights, motors, switches, trolley lines, and transformers. The plan shall be of sufficient size to show clearly the location of such apparatus, and the scale shall be not less than 200 feet per inch. There shall be stated on the plan the capacity in horsepower or kilowatts of each motor and transformer and the nature of its duty. Such plan shall be corrected as often as may be necessary to keep it up to date at intervals not exceeding six months.

FIRE PROTECTION

20. Buckets filled with clean, dry sand shall be kept in all underground stations for immediate use in extinguishing fires. The minimum amount of sand thus stored in any one station shall not be less than 2 cubic feet. No sand will be required if two or more approved fire extinguishers are kept in each station.

DIVISION 2. SURFACE AND UNDERGROUND STATIONS, GENERATING STATIONS AND SURFACE SUBSTATIONS

GENERAL RULES OF SAFETY

See rules 8 to 11, inclusive.

GENERATORS

21. Generators shall be installed upon adequate foundations in a dry place free from explosive vapors or inflammable material.

22. Machines generating a voltage in excess of low voltage shall have their outgoing leads and connections entirely within

the generator frame or bedplate or protected by an approved guard.

SWITCHBOARDS AND CONTROLLING APPLIANCES

See rules 36 to 42, inclusive.

Electrically Driven Ventilating Fan—Housing, Power Supply and Attendant

FIREPROOF BUILDINGS

23. All electrically driven mine ventilating fans, together with the housing of the motor, shall be built of fireproof materials. Underground electric fans shall not be used where the air current contains gas or coal dust in explosive mixtures and when used the surroundings shall be fireproofed within a radius of 15 feet from the motor unless this has a permissible casing.

POWER SUPPLY

24. If the line supplying the power is exposed to the influence of lightning, lightning arresters shall be placed near the point where the wires enter the fan house.

25. The fan attendant shall report immediately any stoppage of the fan to the man legally in charge of the operation of the mine, and means for direct communication between the fan house and generating station or substation supplying the power shall be provided.

ATTENDANT

26. The responsibility for the operation of electrically driven mine-ventilating fans shall devolve upon an authorized person.

ELECTRICAL EQUIPMENT OF TIPPLES AND OTHER SURFACE STRUCTURES

27. All electrical equipment on tipples and other surface structures shall be installed in accordance with the rules of the National Board of Fire Underwriters.

28. Starters of motors on tipples shall be provided with a no-voltage release, and if practicable shall be located within sight of the motors that they control or the machines that they operate. A switch or other means for disconnecting the motor from the power supply shall be installed near the machinery.

Underground Stations

GENERAL RULES OF SAFETY

See also rules 8 to 11, inclusive; also rule 20.

29. All underground stations shall be fireproof and well ventilated with fresh air, and shall be wired in accordance with the requirements of the National Board of Underwriters.

30. Ventilation may be accomplished through openings in the walls, but, with the exception of underground stations in which only switches are installed, the openings shall be provided with noncombustible doors that will either close automatically in case of fire or can be closed easily from outside the room by the attendant.

TRANSFORMER STATIONS

See also "Underground Transformers" and rules 30, 36 to 42, inclusive, 84 and 85.

31. Transformer stations shall be so arranged that if a transformer explodes the oil will not flow outside the room.

32. Wires shall be carried on noncombustible supporting framework and the use of wood shall be entirely eliminated. The supporting framework shall be grounded.

33. All transformers in excess of 50 kilowatt capacity shall be equipped with suitable ammeters in either the primary or secondary circuits, or have provision for connecting portable instruments into such circuits.

PUMP STATIONS

See also rules 50 to 72, inclusive.

34. Pump motors operating at voltages exceeding the limits of low voltage shall be wired inside the pump station with approved wires carried in conduit sealed to exclude moisture or sheathed with lead and so placed or protected as to avoid mechanical injury. The metallic covering shall be permanently grounded.

BATTERY-CHARGING STATION

See also rules 29 and 30.

35. For ventilating battery-charging stations, means shall be provided for obtaining the air from the intake ways and discharging same to the returning air way.

HOIST STATIONS

See "General Rules of Safety for Underground Stations," rule 34 and rules 50 to 72.

DIVISION 3. MACHINES AND APPARATUS

GENERAL RULES OF SAFETY

See rules 3 to 6.

SWITCHBOARDS

See also rules 60 to 72 and 75 to 85.

36. Switchboards shall consist of a substantial framework of iron pipe, or structural steel, on which shall be mounted a panel or panels of incombustible, nonabsorbent insulating material that is mechanically strong and has insulating qualities suitable for the voltage at which it is used. All switchboard mountings, instrument transformers and motor casings shall be grounded.

37. The panels of insulating material may be omitted if each piece of equipment carried on the switchboard is provided with an individual base of insulating material of the character specified for the panels and of adequate dimensions, or has its current-carrying parts mounted on approved insulation self-contained in the equipment, which shall be especially designed for mounting on iron pipe or structural steel frameworks.

38. Switchboards shall be so located that there shall be a straight passageway of not less than three feet in front and in back of the switchboards. These three feet passageways shall be clear of all apparatus mounted on the board and shall be kept free of all obstructions. The space back of the switchboards shall be provided with three feet exits at both ends, but shall not be entered by an unauthorized person and shall not be used for the storage of material or clothing.

39. The space behind switchboards where the voltage exceeds low voltage shall be kept closed by locked doors that can be opened from within without the use of a key, but from without with the key only.

40. Where the voltage of the power supply exceeds the limits of medium voltage, the live high voltage metal work on the front of the switchboard within seven feet of the floor shall be protected. In case of existing installations that do not meet the requirements with this respect to passage space in back of the switchboard, no person shall be permitted back of the board while any apparatus or circuits connected therewith are alive.

41. Conductors shall not cross the passageways back of switchboards except below the floor or at a height of 6½ feet above the floor.

42. There shall be provided for each generator an indicating ammeter or wattmeter of suitable capacity, and for all generators a voltmeter that by closing a switch or manipulating a plug connection can be connected to any generator.

Electric Ventilating Fan Equipment

HOUSING AND POWER SUPPLY

See rules 23 to 25.

CAPACITY OF MOTORS

43. Motors that operate ventilating fans shall be of sufficient capacity to drive the fan at the maximum speed of the motor under normal conditions of service without overloading.

CONTROL OF MOTORS

44. Non-automatic motor-controlling appliances that are used with motors that are not self-starting shall be so arranged that the motor will be disconnected automatically from the supply circuit in case the power supply fails.

Electric Hoisting Equipment

SHAFT HOISTS

45. All electrically operated shaft hoists shall be provided with a device approved for the prevention of overwinding. Where the hoist is used for handling men, additional provision shall be made to prevent overwinding at the man landing. Where a separate overwind protection for men is used a visual signal shall be provided to indicate at all man landings that the overwind device is set for hoisting men. It shall not be possible to operate the signal lights without setting the man landing overwind.

46. Shaft hoists shall have a brake that will keep the hoisting drum under the control of the operator. A brake shall be provided with an automatic trip or release that will apply the brake in case the power supply fails, in case of overwinding or overspeeding, and this brake shall have sufficient capacity to hold the maximum unbalanced load.

47. Hoists for handling men shall be so arranged that when hoisting and lowering men and the legal rate of speed is exceeded the hoist will automatically be brought to a stop. If hoists are designed to operate in balance the driving motor shall be of sufficient size to hoist full loads of men in a maximum unbalanced condition in case of emergency.

48. All electrical safety devices shall be tested at the beginning of each shift and a record of such tests shall be made and signed by an authorized person and kept on file at the mine.

SLOPE HOISTS

49. All electrically operated slope, tail-rope, or endless-rope hoists in mines shall be fitted with adequate controlling devices of approved design.

Underground Motors Other Than Locomotives

See rules 3 to 7 and "General Rules of Safety for Underground Stations," and rule 34.

GENERAL CONSTRUCTION

50. Motors for use in damp places shall have approved moisture-resisting insulation.

51. The outgoing leads and connections of all motors shall be protected from accidental contact by insulation or grounded coverings. Motors that operate at voltages exceeding low voltage shall have their outgoing leads and connections entirely within the motor frame or bedplates, or protected by an approved guard.

PERMISSIBLE MOTORS

52. See Permissible Equipment, paragraph 15.

PORTABLE MOTORS

53. The motors and controlling appliances of portable pumps, hoists, and similar portable apparatus shall be securely mounted and with frames grounded to a common base with the machine that is to be operated. All wiring between the motor and the controlling appliances shall be done in accordance with paragraph 7.

54. Mining machine motors and other motors that use a trailing cable shall be provided where the cable enters the frame of the machine with an approved means for preventing abrasion of the insulating covering of the cable. An approved insulating clamp placed within the frame, or protected by an approved metallic covering, shall be provided for taking all mechanical strains upon the cable terminals. (See also rule 55.)

TRAILING CABLES

55. Trailing cables for portable machines shall be especially flexible, heavily insulated, and protected with extra stout braiding, hose pipes, or other effective covering. (See also rule 74.)

56. Each trailing cable in use shall be examined daily by the machine operator for abrasion and other defects, and he shall also be required to observe carefully the trailing cable while in use, and shall at once repair any defect or report it to the person in charge of electrical equipment.

57. In the event of the trailing cable in service breaking down or becoming damaged in any way, or any person receiving a shock from it, it shall be at once put out of service. The faulty cable shall not again be used until it has been repaired and tested by an authorized person.

58. The trailing cable shall be divided at the motor, but only for such length as is necessary for making connection to the motor, and the cable, with its outer covering complete, shall be clamped securely to the motor frame in such a manner as to protect the cable from injury and to prevent any mechanical strain being borne by the signal ends that make electrical connection to the motor.

PERMISSIBLE PORTABLE MOTORS

59. See Permissible Equipment, paragraph 15.

CONTROL

60. Every stationary motor and every portable motor used underground, except mining machines and drills, shall be protected, together with its starting device.

DIRECT CURRENT MOTORS:

61. On two wire ungrounded circuits, each wire shall be protected by an automatic circuit breaker or by a fuse and switch. On two wire grounded circuits, the ungrounded wire shall be protected by a switch and either a fuse or an automatic circuit breaker. When the circuit breaker trips free from the closing handle the switch may be omitted. On three wire circuits each outside wire shall be protected by a fuse or automatic circuit breaker, but no fuse or automatic circuit breaker shall be used in the neutral wire. A triple pole switch to isolate the fuses or circuit breakers from live source shall be used. In case circuit breakers are used they shall be so arranged that the opening of the circuit breaker in one wire will cause the other circuit breakers to trip.

ALTERNATING CURRENT MOTORS:

62. On three phase delta or Y (star) connected circuits, each wire shall be provided with a fuse or automatic circuit breaker. When circuit breakers are used, two overload trip coils shall be used for ungrounded neutral systems and three overload trip coils for grounded neutral systems. In either case the automatic circuit breakers shall be so arranged that the opening of one will open the others. Switches for isolating the fuses or circuit breakers from live source shall be provided. When air break circuit breakers which trip free from the handle are used, the switch may be omitted.

63. The above devices shall be installed in a convenient position in sight of the motor or in sight of the equipment that the motor operates. The controlling appliances of stationary motors, except the controllers of hoists and similar equipment, shall be mounted upon a switchboard. Resistances may be mounted upon a separate metallic framework.

64. Underground motors that operate car or coal-handling equipment shall be provided at a point near such equipment with a switch or other means for disconnecting the motor from the power supply.

65. Underground motors used to drive booster or auxiliary fans shall be so designed or equipped that they will start automatically when their circuits are connected to the power supply.

66. All non-automatic, current-limiting starting devices, except those used with mining machines, drills, locomotives, and hoists, shall be provided with a no-voltage release.

67. Electrically operated mining machines and drills may be protected by a single fuse and need not be equipped with a line switch if an approved current-rupturing device is installed at that end of the trailing cable which is nearest to the power supply. If a hook is used for this purpose it shall be provided with an insulated handle of approved construction. If cable reels are used they shall be provided with an approved means for opening the circuit under full motor load. (See rule 15.)

68. All insulating material used in connection with starting resistances shall be noncombustible. This includes the insulation of wire used for the internal wiring of resistances.

69. All switches shall be so installed that they cannot close by gravity.

70. Every underground stationary motor of 100 brake horsepower or over shall be provided with a suitable meter to indicate the amount of load on the machine.

71. All wiring between motors and their controlling appliances shall be insulated.

72. Overload release devices on starting rheostats and compensators will not be considered as taking the place of circuit breakers if such devices are inoperative during the starting of the motor. If automatic starting devices are used they shall be inclosed in a fireproof inclosure, or mounted upon a metallic framework clear of all combustible material.

Locomotives

73. Gathering locomotives may be operated with a single-conductor trailing cable if the track provides a good metallic return; otherwise double-conductor trailing cable must be used.

74. The trailing cable of gathering locomotives shall be provided with an approved insulating hook or other device for making connection to the trolley wire, and if a double-conductor

cable is used a similar hook or device shall be provided for making connection to the track rail.

Underground Transformers

See "Underground Stations," "Transformer Stations," and rules 84 and 85.

DIVISION 4. CIRCUITS AND CONDUCTORS

Protection and Control

PROTECTION OF ALL CIRCUITS

75. All circuits leading from generating stations and substations except transformer substations shall be provided at their source with current interrupting devices of such capacities and so installed and adjusted that the circuit will be opened if the current in the circuit exceeds the carrying capacity of the conductors leaving the station. All circuits leading underground exceeding 50 kilowatts capacity shall be provided with a suitable ammeter or means for inserting a portable ammeter.

76. Two wire ungrounded direct current circuits shall be protected by an automatic circuit breaker or by a fuse and switch in each wire. Two wire grounded direct current circuits shall be protected by a switch and either an automatic circuit breaker or a fuse in the ungrounded wire. When the circuit breaker trips free from the closing handle the switch may be omitted. Three wire ungrounded direct current circuits shall be protected by a fuse or automatic circuit breaker in each outside conductor, but no fuse or circuit breaker in the neutral conductor, and in addition a triple pole switch to isolate the fuse or circuit breaker from live sources. Where one of the outside wires is grounded this should be treated as neutral and protection provided only in the other two wires.

77. Three phase delta or Y (star) connected alternating current circuits shall be protected by a fuse or an automatic circuit breaker in each wire. When automatic circuit breakers are used, two overload trip coils shall be provided for ungrounded neutral systems, and three overload trip coils for grounded neutral systems. In either case the automatic circuit breakers shall be so arranged that the opening of one will open the others. Switches for isolating the fuses or circuit breakers from live sources shall be provided.

PROTECTION OF CIRCUITS LEADING UNDERGROUND

78. Each outgoing circuit that leads underground and extends over the surface of the ground 500 feet or more from

the generating station or substation shall be equipped with lighting arrestors of approved type, with proper ground connection, at the generating station or substation and also at the point where the circuit enters the mine.

79. Lightning arresters shall be connected on the secondary side of all transformers that feed underground circuits unless there is provided other suitable means for discharging abnormal voltages. Lightning arresters on the primary side will be considered suitable if the secondary circuit above ground is less than 50 feet long.

80. Each power circuit leading underground shall be provided with a disconnecting switch in each conductor capable of opening the circuit under load. This switch shall be located where the circuit enters the mine or within 100 feet of this point.

81. Each individual circuit leading underground, whether alternating or direct current, shall be provided with automatic overload protection at or before the point where it enters the mine working. If two circuit breakers are used they must be so interlocked that both will open in the event of one opening.

PROTECTION OF UNDERGROUND CIRCUITS

82. All branch circuits of a net work shall be provided with current-rupturing devices of such capacity and so installed that the current in any part of the branch circuit cannot exceed the carrying capacity of that part as defined by rule 14, if the length of the complete branch circuit exceeds two miles.

83. Minimum size of conductors used to supply power to coal cutting equipment shall be No. 4 B. & S. Minimum size of conductors for supplying pumps shall be No. 8 B. & S. All conductors supplying pumps and motors shall come within the limits given under paragraph 14.

PROTECTION OF UNDERGROUND TRANSFORMER CIRCUITS

84. All transformers shall be equipped with automatic current-interrupting devices in at least the primary side of the transformer; and also in the secondary side of the transformer if the current-interrupting devices in the primary are not readily accessible from the transformer.

85. When the voltage of circuits entering or leaving underground transformers exceeds the limits of medium voltage, current-interrupting devices shall consist of an oil breaker in each conductor and each switch shall be provided with an automatic overload trip.

86. When the voltage of circuits entering or leaving transformers does not exceed the limits of medium voltage, their protective devices may consist of an oil circuit breaker as described above or of a knife switch and automatic circuit breaker in each conductor, except that approved fuses may be substituted for circuit breakers.

Installation of Surface Circuits

SURFACE TRANSMISSION LINES

87. Power wires shall not be placed on the same crossarms with telegraph, telephone or signal wires. When placed on the same pole with such wires and below them, the distance between the two inside pins of each crossarm carrying power wires shall not be less than 26 inches.

88. Transmission lines operating at voltages in excess of 5,000 volts shall not be placed on the same poles with telephone circuits that are or can be connected underground unless the telephone lines are provided with approved protective devices that are capable of preventing the higher voltage from entering the underground telephone circuits.

SURFACE TROLLEY LINES

89. All surface trolley lines shall be kept at least 6½ feet above the top of the rail and shall be protected at all regularly provided crossings by a guard that will prevent men from coming in contact with the wire either directly or by bringing tools in contact with the wire.

90. That part of the trolley circuit used for surface operations shall be so arranged that it can be entirely disconnected from the power supply without cutting off the current inside of the mine or interfering with the operation of other apparatus not a part of the trolley system.

91. Trolley wires shall not be smaller than No. 0 B. & S. gauge copper wire or No. 4 B. & S. gauge silicon-bronze wire, and shall withstand easily the strain put upon them when in use.

92. Trolley wires shall have double insulation from the ground unless an approved single insulator is used. In wooden pole construction the pole will be considered as one insulation.

Methods of Carrying Circuits Underground

SUSPENSION IN SHAFTS

93. All power conductors installed in shafts shall be covered with approved insulating material throughout or protected in

an approved manner, and shall be firmly fastened to or suspended from properly supported insulators, unless the conductors are sheathed with lead or inclosed in conduit. Conductors used as returns in shafts for ground-return systems shall be supported on insulators, but need not be covered with insulation.

94. Shaft cables that are so constructed that the whole or any part of the cable is not self-sustaining shall be supported in an approved manner at such intervals as may be necessary to prevent the occurrence of undue strains in sheath, insulation, or conductors.

95. Shaft cables shall be so placed or protected that they are not liable to injury from falling material.

SUSPENSION IN BORING HOLES

96. All power conductors except grounded returns installed in bore holes shall be covered with insultation and supported in an approved manner that shall prevent the occurrence of undue strains in sheath, insulation, or conductors.

97. Telephone or signal wires shall not be installed in the same bore hole with power wires unless either the signal or the power conductors in the bore hole are incased in metallic coverings that are permanently grounded.

ENTRANCE OF CONDUCTORS THROUGH DRIFTS OR SLOPES

98. Low and medium voltage power conductors in drifts or slopes may be installed bare, but shall be carried on suitable insulators securely fastened to the sides or roof of the entry. If the drift or slope is used for traveling, the conductors shall be protected as required in rule 105.

Installation of Underground Power Circuits and Conductors

99. All joints in wires shall be made electrically and mechanically efficient either by the use of an approved mechanical connector or by soldering.

100. Underground conductors will not be considered as shockproof unless they are incased in metallic covering that is thoroughly grounded.

101. Low and medium voltage conductors shall be carried at least 6 inches from the trolley line and on the nearest rib side of it, and shall be supported on insulators of an approved type. When the height of the entry does not exceed 5 feet, the insulators shall be placed not more than 20 feet apart and as much closer as is necessary to support the wires properly.

102. If the height of the entry is more than 5 feet, the insulators shall be placed not more than 30 feet apart and as much closer as may be necessary to support the line properly.

103. High voltage conductors shall be carried in metallic coverings and shall be installed in an approved manner with special reference to the conditions under which they are installed.

104. The negative or return wire of grounded systems shall be treated in exactly the same manner as the positive or live wire and afforded the same support and insulation.

105. All conductors in traveling ways except haulage roads used for traveling (see rule 11) and medium voltage conductors in room entries shall be protected throughout that part of the entry that is used for traveling, unless the conductors are at least 6½ feet above the rail, in which case protection will be necessary only at those points where men are required to work beneath the conductors or pass under them. The insulators may be supported directly from the roof or side or may be attached to timbers not less than 3 by 4 inches in size or may be secured to steel mine timbers. The insulators shall be placed so that the height of the conductors above the bottom will be comparatively uniform.

106. All conductors shall be strung with the least practicable sag between the supporting insulators and shall be maintained in this condition and kept from contact with rock, coal, timber, or other noninsulating material.

107. All main conductors shall be sectionalized by approved switches at points not more than 2,500 feet apart.

BRANCH CONDUCTORS

108. Branch conductors shall be supported and maintained in the same manner as main conductors and given the same protection.

109. At the point where branch circuits leave the main circuits there shall be placed a switch for cutting off all current from the branch circuits.

110. Where wires pass through partitions or wooden or other brattices they shall be protected with approved insulating tubes held in place with tape or thoroughly cemented in place so that they cannot move.

111. Entries or passageways in which wires are installed must be kept sufficiently free from rock, slate, or other material to permit ready access to the wires at all times.

ROOM WIRING*

112. Rooms in which gas or coal dust exists in explosive mixtures shall not be wired. Where room wiring is permissible it shall be treated as branch circuits and equipped at the room entrance with switches or some other device that will entirely cut out the wiring when not in use.

TROLLEY WIRES

113. Trolley wires shall be of hard-drawn copper not smaller in size than 1/0 B. & S. gauge and shall be securely supported on approved hangers which may be attached directly to the roof or securely fastened to timber or equivalent.

114. The height of trolley wires above the top of the rail shall be made as uniform as practicable.

115. Trolley wires shall be so placed as to give the maximum clearance practicable and kept in as straight a line as possible.

116. On straight runs the hangers shall be placed not more than 20 feet part where the height of the roof above the track is 5 feet or less and not more than 30 feet apart where the roof is more than 5 feet above the track. On curves the hangers shall be placed so close together that the trolley wire at any one hanger may be entirely disconnected without exposing the locomotive runner to danger of contact.

117. Underground trolley lines shall be sectionalized every 2,500 feet by placing in the line a switch by which the line can be entirely disconnected from the power supply. All branch trolley lines shall be provided with a frog at the point where they leave the main and also with a switch installed at or near the frog, by which the branch can be disconnected from the main.

118. Trolley wires that are less than 6½ feet above the top of the rail shall be protected at all points where men are regularly required to work or pass under them and at all points where men may come in contact with the wires.

BONDING

119. The tracks of all main haulage systems that use a rail return shall be bonded at every rail joint, and cross bonding shall be placed at intervals not exceeding 200 feet. Special provision shall be made for bonding around all switches, frogs, or openings in the track so as to insure a continuous return.

---

*The Bureau recommends that rooms be not wired.

LIGHTING CIRCUITS IN PLACES WHERE GAS OR COAL DUST DO NOT OCCUR IN DANGEROUS MIXTURES

See also rules 133 to 135, 137 to 139.

120. Lighting wires shall be attached to power wires by soldering or by fastening under a set screw in a lug attached to the trolley hanger, or by such other devices as will prevent the wires from becoming loose.

121. All wiring shall be supported on noncombustible nonabsorptive insulators which shall separate the wires by at least an inch from the surfaces wired over. Wires of opposite polarity shall be kept at least 2½ inches apart for low voltage and 5 inches apart for medium voltage.

122. No wires smaller than No. 14 B. & S. gauge shall be used for lighting circuits in nongaseous places.

123. When the ground is used as a return for lighting circuits the return wire shall be attached to the track by bonding to the rail or by attachment to regular bonding in an approved manner. This ground connection shall be made of not less than No. 8 B. & S. gauge copper wire which shall be buried below the surface and carried to the side of the entry and thence on porcelain insulators to the roof or a point at least 5 feet above the track.

LIGHTING CIRCUITS IN PLACES WHERE GAS OR COAL DUST OCCURS IN DANGEROUS MIXTURES*

See also rules 136 and 140.

124. The potential of lighting circuits shall not exceed the limits of low voltage.

125. Only permissible equipment shall be used for lighting circuits.

126. The circuits shall be run from the outside with all switches and protective devices on the surface, or by using permissible switches, fuses, or circuit breakers situated underground, or by ventilating with fresh air the place where the switches and fuses are installed.

---

*Bureau of Mines recommends that in mines in which fire damp is given off, in dangerous quantities the use of lighting circuits be confined to those entries and places that are ventilated by intake air currents which have not passed by or through abandoned or active workings, except that a lighting circuit may be used in a shaft or slope bottom ventilated by a return air current in which the percentage of methane does not exceed 1 per cent.

127. If the circuits are run from the outside with the controlling devices installed on the surface, the conductors leading underground shall be not smaller than No. 8 B. & S. gauge and each circuit shall be provided above ground with a suitable ammeter.

128. Each circuit shall have a double-pole switch and fuses or circuit breakers in the case of two-wire systems, and a three-pole switch and fuses or circuit breakers in the case of three-wire systems.

129. The fuses or circuit breakers shall be designed or arranged to operate when the allowable load is exceeded by 25 per cent.

130. No wire smaller than No. 12 B. & S. gauge shall be used in lighting circuits except for the leads of weatherproof sockets, and these shall not be less than No. 14 B. & S. gauge.

131. In case distribution is made from a point underground, the distribution switches and fuses shall be mounted on a noncombustible panel mounted in a metal cabinet and fitted with a hinged door. This cabinet shall be used whether permissible switches are required or not. The cabinet shall be fitted with a door properly hinged so that it will close tightly and shall be provided with a fastening that will hold the door securely in a closed position.

132. Flexible lamp-cord connections are prohibited except for portable lamps, as covered by rule 141.

DIVISION 5. MISCELLANEOUS EQUIPMENT

FIXED ELECTRIC LAMPS

For wiring and control requirements of fixed electric lamps, see rules 120 to 132, inclusive.

133. Electric lamps used to illuminate haulage roads, side tracks, and similar passageways where gas or coal dust do not exist in explosive mixtures may be connected to power and trolley lines.

134. Lamps may be connected in multiple or in series, and no fuse or switch will be required for one lamp or series of lamps. A switch may be used if it is desired to switch the lamps on or off, and a fuse must be used if it is necessary to protect any considerable length of wire.

135. All sockets shall be of the keyless weatherproof type and have no exposed metallic parts. Lead wires shall be rubber covered and of a size not smaller than No. 14 B. & S. gauge. The lead wires shall be made a part of the socket and per-

manently connected thereto. These wires shall be attached directly to the line wires by soldering or by mechanical connectors. Sockets shall not be supported by the line wires, but by an additional insulator or insulators or some other device that will be entirely independent of the line wires.

136. In mines that contain gas or coal dust in explosive mixtures and in which electricity is used only for lighting, or where the lighting circuits are separate from the power circuits, the voltage of such circuits shall not exceed the limits of low voltage and all lamps shall be connected in multiple.

137. Not more than 24 lamps shall be attached to any one circuit and the power taken by any one circuit shall not exceed 1,300 watts.

138. Permissible mine incandescent lamps shall be used where gas or coal dust occurs in explosive mixtures.

139. Incandescent lamps shall be so installed that they cannot come in contact with combustible material.

140. Electric lamps shall be replaced by an authorized person only, and in places where gas or coal dust exist in explosive mixtures, only after an examination for gas has been made with a safety lamp.

PORTABLE ELECTRIC LAMPS

141. Portable incandescent lamps, other than permissible battery lamps, shall be protected by a heavy wire cage which completely incloses both lamp and socket and shall be provided with a handle to which both cage and socket are firmly attached and through which the cord supplying the current is carried. The socket shall be keyless and the lamp circuit shall be protected by a fuse.

142. When a portable lamp is one of several connected in series between a source of voltage and the earth the portable lamp shall be the one in the series electrically nearest to the earth connection.

143. The use of portable lamps with leads of ordinary flexible cord is prohibited. Only lamp cords approved for this purpose shall be used.

SELF-CONTAINED PORTABLE ELECTRIC LAMPS*

144. Permissible self-contained portable electric lamps shall be used in places where gas or coal dust occurs in explosive mixtures.

*The use of self-contained portable electric lamps of suitable design and construction is recommended for all coal mines, provided that in places where gas or coal dust occur in dangerous mixtures, or in places where black damp is given off in large quantities frequent inspections with safety lamps are made.

ELECTRIC SHOT-FIRING EQUIPMENT

145. Electricity from any grounded circuit shall not be used for firing shots.†

146. Special precautions shall be taken to prevent shot-firing conductors from becoming grounded or from getting in contact with other electric circuits.

147. Only authorized persons shall be allowed to fire shots with electricity in a mine.

148. The electric detonators or igniters and leads thereto shall be suitable for the conditions under which the blasting is carried on and shall be approved by the Federal Bureau of Mines.

149. Portable shot-firing machines shall be of efficient design and shall be substantially constructed. All such machines shall be inclosed in strong, tight casings.

150. Primary or secondary batteries used for shot-firing shall be inclosed in a well-constructed casing provided with a special form of contact plug for making the connection between the batteries and shot-firing leads. The design of the plug shall be such that considerable pressure will be required to make the contact, which will be immediately broken unless the plug is forcibly held in position.

151. There shall be no exposed contacts on the outside of the battery casings.

152. All portable shot-firing machines shall be equipped with a detachable handle, connecting plug, key, or similar approved device without which the shot-firing circuit cannot be closed, and which shall under no circumstances pass from the custody of the person authorized to fire the shots.

153. No shot-firing device shall be connected to the shot-firing leads until all other steps preparatory to the firing of the shot have been completed and all persons have moved to a position of safety.

DISCONNECTION OF LEADS

154. Immediately after the firing of a shot the firing leads shall be disconnected from the supply of electricity, and no person shall approach a shot which electricity has failed to explode until the firing leads have been so disconnected and an interval of 10 minutes have elapsed since the last attempt to fire the shot.

†It is recommended that all shots be fired electrically, and that for inside firing shots be fired separately, and one at a time on account of the danger of causing blown-out shots and resultant explosions. If fired in groups the firing should be done only from the surface.

SHOT FIRING FROM SURFACE

155. In coal mines employing the system of firing shots electrically from above ground when everyone is out of the mine, a complete metallic circuit shall be employed and both wires shall be covered with insulation and supported upon glass or porcelain insulators.

156. There shall be a switch at the mouth of each working place so that the circuit can be kept open while the miners are at work and closed only when the shots have been prepared and the miner or miners are leaving the place.

157. There shall be a locked switch in the circuit at the entrance to each heading or side entry which shall be locked open and be thrown in only by an authorized person when all the men are out of the respective heading or branch entry.

158. There shall be in the circuit at the foot of the shaft or slope two plugs with flexible leads not less than 5 feet long to break further the main circuit of the shot-firing system until all the men in the mine have gone out, when the plugs will be put in by the one man authorized to do so. Provision shall be made for locking the plugs out of circuit.

159. There shall be located in the power house a locked switch to be used for connecting the shot-firing circuit to the generator or power line. The switch shall be thrown in only by the man who is authorized to do the shot firing and not until the men have been checked out of the mine.

160. There shall be located in the shot firer's cabin a locked firing switch which shall be thrown only by the authorized shot firer after all the men are out of the mine and after all other switches have been thrown in. In firing shots, this switch shall be thrown but once.

161. To insure that all men are out of the mine, an approved system of checking shall be employed.

162. All shot-firing lines shall be carefully insulated and the two wires that form the circuit shall be placed on the side of the entry or passageway opposite from that on which the trolley wire is placed, and so far as possible other roads than the trolley road shall be used for carrying the wires into the working places.

ELECTRIC SIGNALING EQUIPMENT

163. The parts of electrical signaling systems used in connection with mines shall be designed, constructed, and installed in an approved manner. No voltage in excess of 25 volts shall be applied to signal circuits in places where gas or coal dust occur in explosive mixtures.

164. Only permissible equipment shall be used in places where gas or coal dust occurs in explosive mixtures.

165. Suitable precautions shall be taken to prevent electric signal or telephone wires from becoming grounded or from coming in contact with electric conductors, whether insulated or not. Signal circuits and telephone wires shall not be installed on the same side of an entry as power conductors.

Respectfully submitted,

(Signed) KARL A. PAULY,
Chairman Committee on Power Equipment.

(Signed) A. B. KISER,
Chairman Committee on Underground Transmission.

MR. PAULY: Unfortunately this report of last year was published too late to circulate and receive comments by our committee in time to act on them for this meeting. As a matter of fact I have only received a very small number of replies to my letter which was sent out with the report. We asked those reviewing the report to reply as quickly as possible, but at the same time to analyze the material in the report thoroughly and give us thoughtful criticism rather than off-hand comment.

I think it will be at least a month or two more before a sufficient number of replies will have been received from the field to make it worth while for us to meet; but immediately after a sufficient number are received, we will again meet and submit a report, which cannot be said to be final because these rules will have to be modified to keep up with practice, but will put it in sufficient shape so that we will feel that it can be safely circulated.

Has Mr. Kiser sent you any report?

CHAIRMAN ROBERTS: Something similar to yours.

MR. PAULY: We have met jointly and I discussed the situation with him and my statement is based on the joint opinion of both of us.

CHAIRMAN ROBERTS: Thank you, Mr. Pauly.

Mr. Kiser is chairman of the Committee on Underground Power Transmission that rendered the joint report with Mr. Pauly's Committee on Power Equipment last year. Mr. Pauly's remarks apply to the work of the committee of which Mr. Kiser is chairman, and I will therefore make no further comment on that report.

DISCUSSION ON UNDERGROUND MINING AND LOADING MACHINES

CHAIRMAN ROBERTS: Our next report should be from the Committee on Underground Loading and Mining Machines, of which Mr. C. A. Cabell of Charlestown, W. Va., is chairman. As I advised you in my report for the General Committee reviewing all these reports, this Committee rendered no report. I was in hopes, however, of being able to get together two or three members of the Committee that are in the city and to have a program prepared at least that could be presented to the Conference for consideration, but I have been unable to get those gentlemen together and to prepare that program. However, Mr. Farnham, one of the active men on the Committee, is present and he reviewed very carefully last evening the correspondence that the chairman of this Committee has had with the members and having reviewed that, I would

like very much to have Mr. Farnham make a brief statement to us, which is all that we can have at this time on behalf of the Committee on Mining and Loading.

MR. FARNHAM: The recommendations and reports sent in by individual members of the Committee to Mr. Cabell concur with the previous recommendations made for standardization. The first and most important is a uniform mine track gauge which they recommended to be 42 inches. These reports I have are from representatives of the Loading Machinery Manufacturers and they speak of the necessity of some improvement in the placing of cars at the mine faces and standards to be adopted in the transportation which will make the loading machine operations successful. Loading machines have been built and have shown their capacity and ability to load cars in a very short space of time, but they have not been adopted broadly today for the simple reason that the transportation improvements have not kept pace with the improvements in the loading machinery.

The Committee believes that it is necessary to formulate some plans or sets of standards for mine development and operation which will be necessary and their adoption will be necessary before this class of machinery can meet with a widespread success.

These two points are the main ones that have been brought out. In fact, I am quoting rather largely from Mr. Levin's letter, who I see is present, and I think Mr. Levin might say something on that question.

CHAIRMAN ROBERTS: Mr. Farnham has suggested that we have another member of the Committee present, Mr. N. D. Levin, Chief Engineer of the Mining Department of the Jeffrey Manufacturing Co. speak. We would like very much to have Mr. Levin make a statement to us on behalf of his Committee.

MR. LEVIN: I really have nothing further to say than what Mr. Farnham has already said; that is, that there are already a good many loading machines on the market, but so far they have not been used extensively because the mines are not arranged to handle the coal, they don't supply the cars without interruption and they don't seem to manage to have places cut and ready to load, so there are really two things needed. One is coal to load and the other cars to load it into. The machinery is already available.

That is all I have to say.

CHAIRMAN ROBERTS: There is another member of this Committee in the city, but he is not in the room, Mr. William Whaley, one of the manufacturers of loading machines, and I regret very much that he is not here.

I would like to make a brief statement on behalf of this Committee. I have interviewed the members of this Committee and written to the chairman and the burden of their alibi has been that loading machines were too new to standardize, and I have not been able to impress on the members of this Committee or their chairman that they are to consider and recommend to this body a standardization of mining and loading machines. Mining machines are not in the initiative stage by any means —they have been in use for many years and are commercially developed, and we have not had word from this Committee regarding half of their subject. It is something that, to my mind, is a very large subject and I think a sub-Committee should have been formed to consider and report back to the main Committee.

I agree entirely with the Committee regarding the status of the loading machine, but if I were directing the work of this Committee, I should have taken it up somewhat in this manner, which is following the method of our other committees in handling their work. The very fact that the loading machine is a recent invention and not fully developed and perfected, to my mind gives the very best opportunity for the work that we are trying to do on behalf of equipment. The men who are taking up equipment that is fully developed will have a great deal more difficulty

in steering a standardization program than the man who is taking up equipment that is in the development stage. And if this Committee would work out a comprehensive program for the development of that machine, or any type of machine, point out the difficulties to the mining industry of the adoption of that machine and what the mining industry can do to promote its use, this Committee would be doing a very great service to the mining industry, not only in Coal Mining but in Metal Mining.

From my conversation with men who have used machines and men who are marketing loading machines, it is evident that present mining methods are not such as could make the use of the loading machine as advantageous as it was hoped it would be or as advantageous as it should be—in other words, people that install these loading machines at the present time do not get the full benefit of that equipment that they should derive.

There is no question in my mind whatever that the loading machine is going to be developed and perfected and is going to come into general use. It is a natural consequence of industrial conditions in America, and especially in the mining industry. If the men who are promoting this enterprise had not foreseen that, they would not have spent many thousands of dollars in developing that machine. They knew the mining conditions, they knew that those mining conditions were such as to warrant spending money on a loading machine; but as I have said, our present mining methods do not seem to make the best and largest use that they should of the loading machines and it is quite possible that, to secure that proper value from these machines in commercial use, we may have to quite largely change our mining methods. If thereby we can load coal for a fraction of what it costs to load it now, we can afford to change our mining methods, especially in new mines, mines that are being now developed or will be developed in the future.

Therefore, to my mind this Committee has a very large service to render to the industry and I am greatly disappointed that this Committee has not brought in a report for this Conference. The only excuse I can offer for the Committee is the one I gave you in my report yesterday, that the chairman of the Committee, who has to direct the work of the Committee of course, has been overwhelmed in his regular daily duties in West Virginia until they sent him to take a rest cure. That is really the reason that this Committee did not render a report, although I do believe that the members of the Committee, as well as the chairman, need this new vision of their work, and that is why I have taken the pains to present it, because I think they have a large field of usefulness.

We have no report, but this transcript will be written up and will be digested and put into the next "Standardization Bulletin." Therefore I would like very much to have some of the men in this Conference express their views on this subject, and it will become a part of the working material on which this or a reorganized committee will develop this valuable subject. I would like to hear from someone on this. Mr. Hood, I would like to have you add to this discussion.

MR. HOOD: I am afraid I have little or nothing to say on this subject because, as Colonel Roberts has well stated, it seems to be a matter of correlation of mining methods with new mechanical equipment, which demands a change on the part of the mining man. My interest lies particularly in the mechanical end and in the machinery end; as Colonel Roberts says, the machine is a pretty good machine so far. It will do more than it has been asked to if given a chance.

I am sorry Mr. Rice is not here because, representing the mine interests of the Bureau, this would naturally fall in Mr. Rice's division.

CHAIRMAN ROBERTS: We have quite an array of talent at this Conference. I will be greatly disappointed if someone does not add some ideas on this subject. I would like to learn whether this Conferenece agrees with the general statement of the possibilities of this subject that I

have enumerated or whether they do not agree with me. Don't hesitate to disagree because we must develop what the sentiment of our Conference is before this Committee will be justified in pursuing this subject. In other words, they will not be justified in pursuing this subject because I think it is a good thing to do, it will be because this Conference says it is a good thing to do. I would like to have some more of you express yourselves pro or con.

MR. LEVIN: You stated that we ought to develop machines, loading machines. I want to emphasize the fact that the loading machines are already developed. There are several good, practical loading machines on the market. The company I am connected with brought out a machine in 1908 that would load a ton a minute and better, but still it was not a paying proposition. It was tried out in a good many mines in different coalfields but it was always the same, the pit boss would not provide cars, or they would not have a room undercut or shot or the car was off the track or something, so that we had to give it up. We have developed a first-class loading machine, but it was not practical. The mine officials did not realize that they had to do their part.

Later on we developed a small, inexpensive machine that does not pick up the coal from the bottom but the men shovel the coal onto it. That machine pays in almost any kind of a mine and it seems as though that type of machine is the thing to use in all the mines. Operators realize that they have to arrange their mine and systematize it before they can use a more expensive and a larger machine. There are machines of both kinds on the market at the present time and it is up to the mine operators —I think that this Committee ought to make that clear—the mine operators have got to do their part of it. The manufacturers have spent hundreds of thousands of dollars and no result has been obtained so far. It is up to the mine operators.

MR. FARNHAM: I would like to say something on behalf of the Committee. As one of the members of this Committee that is somewhat under fire for lack of work, I must say on my own behalf that I have been out of the country for nearly half the year and found quite an accumulation when I came back. I have noticed, however, that the only three members present out of quite a large Committee are representatives of manufacturers. There are an equal number of coal mining men on this Committee. Mr. Levin has just mentioned the difficulty of getting coal mine men sometimes to fix tracks and do other things underground. This Committee finds difficulty in getting them to come around to their Committee meetings. If we could get together in a fair-sized meeting, I know we could dispose of some of these matters very quickly.

MR. HUNNER: I don't know whether it would interest the gentlemen present to know what our experience has been in the Lake Superior district or not. We are shipping normally about fifty million tons in a season. That is just about half of the production from underground mines. About ten years ago the first loader was developed, called a Hulby loader and since that time there have been at least four or five different machines developed in that district that have had more or less success in operation. The two machines that are in use today are the Hole Loader and the Shove Loader.

CHAIRMAN ROBERTS: Will you kindly state what you are loading?

MR. HUNNER: We are loading iron ore. The Lake Superior district is an iron mining region. I thought you all knew that. The two machines that I have just mentioned have given the best success. The machines will stand up and they will do the work but our great difficulty up there is to develop our underground operations so that it is possible to use these machines. I might say that, in that connection, I know something of operating myself. We are operating normally twenty-two mines and we have used three different machines. To date I would not say that the machines are a success excepting in straight-away develop-

ment work as compared with the use of common labor. We have gone to the trouble of endeavoring to change our mining system so as to accommodate the use of these loaders.

In stoping operations where you are stoping in large rooms, there is no question but what the machines are a success, but where you are operating with small clearances as we have to operate in an iron mine where we are mining soft ore, the conditions are quite different and they work against the use of the loader.

The two loaders that have been used there principally will operate within a five-foot radius and that will give you something of an idea of the necessity of keeping the size of the machine down, otherwise it would be impossible to use it.

The crushing conditions of the timbering are such that it is impossible to move these machines from place to place if they are not built small in size and when you build them small in size, of necessity you have got to give way to strength because a smaller machine is more apt to break down frequently. As I stated before, our real success in the use of these machines has been in developments where the matter of time was the principal consideration. Where we were rushing the work we found the machines adaptable to our conditions, and also stoping in the larger rooms.

MR. LEVIN: I want to state that my remarks refer to coal mines. I know that in iron mines they have done a whole lot more to meet the manufacturers of loading machines half way.

(Note. After considerable more discussion the Chairman put the question as to whether the work of this Committee should be continued, and it was decided to continue the work.

After another long discussion it was decided to eliminate the word "sub" from the term "Sub-Committee" and that henceforth these subcommittees are to be known as "Committees," and that the sectional committees will be called "Sub-Committees" and given numbers whenever necessary.)

CHAIRMAN ROBERTS: Having completed our program for this afternoon, if the members have nothing further to discuss, we will stand adjourned.

The meeting adjourned at 5:30 o'clock.

ADJOURNMENT.

(Note. The following discussion on Loading and Mining Machines was taken from the Wednesday morning Joint Session of the Metal Mining and Coal Mining Branches.)

CHAIRMAN ROBERTS: I promised that if we could get hold of Mr. Rice, the Chief Engineer of the Bureau of Mines, we would have him speak to us briefly on the work of the Committee on Mining and Loading Machines. This Committee, Mr. Rice, laid down on us, didn't give us any report, but we had a very interesting discussion when we called on Mr. Hood for some advice as to the standardization of mining and loading machines; he said he was a mechanical engineer, but that if George Rice was here he could tell us something.

So we inveigled you into this session this morning and now I would like to have you make a few remarks on that subject, but I will make it a little plainer as to what we want.

You know we are trying to standardize. This Committee on Mining and Loading Machines has not apparently quite got the cue yet and they have not standardized anything. They have not given us any recommendations for standardization; yet, in the discussion yesterday they developed considerable interest in standardization of mining and loading equipment, etc.; and after quite a full discussion, the session voted that

this Committee was to continue its work or we would reorganize it and get a Committee that would do the work.

So the standardization of that classification of equipment is going to go forward either under that Committee or a reorganized committee; but we want to get into the records for that Committee as many good suggestions as possible as to what might be done. What can that Committee do for the benefit of the mining industry on the standardization of mining and loading machines, not just loading machines, but also mining machines, which have been on the market for a long time.

I suggested further that there is another smaller classification of materials that should come under the work of this Committee, viz.: miners' lamps. This had not been allotted to any Committee, and I think that miners' lamps, and possibly some other things that had not occurred to us, should go to this Committee. Miners' lamps is a subject that is up now to the General Committee for allocation to somebody, and I suggest this Committee take it. I think it properly belongs to them.

At any rate we would like to hear from Mr. Rice, Chief Engineer of the Bureau of Mines.

MR. RICE: That is an unexpected surprise—I can't say it is a pleasant one. I think I will have to pass the buck, as some others have done before me. The problem is a pretty big one. If it had been loading machines alone we could perhaps have said, as Colonel Roberts suggested, that they were rather too new to arrive at any conclusions. Of course mining machines have been longer with us. I suppose the plan must be rather one of standardizing the use rather than the machines themselves.

CHAIRMAN ROBERTS: Correct!

MR. RICE: Because otherwise I think it would tend to kill initiative in developing new apparatus. I rather feel that if you really want to get something into the records, it might be desirable if some written statement were prepared, perhaps jointly. I was not serving on this Committee at all and so I don't feel that I have to apologize in any way. The thing, as you must realize, is a new one to me and the thought of such standardization, for when you come to standardize the use offhand, for instance in coal mines, it would be something like standardizing coal beds, and we can't do that very well.

If it comes to a question of safety, why that is a different matter because there we touch perhaps on the dust problem both as a matter, if it is coal dust, of the possibility of ignition of the dust, or again as an unhealthy thing to breathe, although we have not heretofore considered that soft coal was unhealthful from the standpoint of injury to the lungs; at least statistics have not shown it.

In the matter of ignition of gas, there we are touching on the electrical problem which I believe you have already under way from another point of view.

CHAIRMAN ROBERTS: That is under another Committee.

MR. RICE: But the performance of cutting and the like, it seems to me, is an extremely difficult thing. I would be glad to discuss it with others and perhaps submit a paper at a later time, but at present I would like to draw out from the Chairman and others just what you can standardize in use. The use of mining machines, speaking of coal, is so much affected by the method of mining that you may adopt and we are constantly looking to improvement in the method of mining. That is to say, with certain kinds of machines, like the old machine (which has been practically discarded now) you had to keep your props well back from the face; it was not adapted to long wall or semi-long wall. The present machines are better adapted in that way.

I am myself looking for light. When it comes to the question of loading machines, I may say, if you want to touch on that, Mr. Colburn of the Bureau of Mines has devoted the better part of the year to a study

of loading machines throughout the country and perhaps may make some suggestions along that line.

MR. HOOD: In justice to myself and Mr. Rice, the particular "buck" that was passed to Mr. Rice yesterday was this: as I understand it, the loading machine has been developed so that it will perform its function. The trouble is to keep it busy. That apparently requires a new method of mining and transportation, and it is on that particular point that they were groping, and I am quite sure that if Mr. Rice would speak to that point, it would supplement yesterday's discussion.

MR. RICE: Does this refer especially to metal mining or coal mining?

CHAIRMAN ROBERTS: More particularly to coal mining. They seem to have solved their problems in adopting their methods to a larger use of the loading machine in metal mines than in coal mines.

MR. RICE: I would not say it has been solved in metal mines by any means. You take scrapers, which have been so extensively used now and are coming in more and more; I think Mr. Colburn will bear out the statement that there is a very considerable amount of study that we think needs to be done looking perhaps to the modification of the method of mining in order to fit perhaps the shovel, or to change the scraper in order to fit the method of mining. The Bureau of Mines now has a man who is giving that matter a great deal of attention in the Joplin District, where the operators have made a specific request for help in that particular connection.

The tremendous variety of ways and the inter-relation as between the method of mining and the kind of machine makes it very difficult for me to visualize just now how you are going to standardize. So you see I am not very helpful to you in that respect.

Similarly in coal there is again an inter-relation of mining methods to the machine which makes it difficult to standardize. If you standardize the use of the machine you have got to have a fixture, as I see it, of the method of mining and we are not satisfied yet, either with the loading machine or with the method of mining because they are looking for betterment.

I personally would not like to go very much further without having a chance to study that a little bit more and hearing discussion by others.

MR. DALY: This is a very interesting subject to me. For a long period of time I have been trying to get somebody, somewhere, somehow to come to this mechanical loading in metal mines. I don't think we can bring the mine to the loader, we have got to bring the loader to the mine. I was in hopes he would touch on that. That is what I am trying to urge him up to now.

In the metal mines, particularly in some of the fissure vein districts, the conditions are such that we don't have very large ore bodies at any given point. We have a multitude of them, very many of them, but not enough to take in large headings, large haulage systems or large shovels. On our different levels we have several faces, but we may not have faces enough upon any given level to keep a loading machine occupied.

For that reason I would be inclined to want to find out some information as to the manufacturer, if one exists, who makes a shovel small enough to go on a cage without disconnection and can be transferred from level to level.

Mr. Rice, do you know of anybody who is doing that sort of thing?

MR. RICE: I do not, but I suggest that Mr. Colburn, who has made a specific study of that, could tell us what has been done.

CHAIRMAN ROBERTS: You gentlemen have not quite got the cue yet. While this comes under the subject of standardization, we are not so earnest about standardizing the loading machines as we are to try to adapt the loading machine to some method so it will come into use. They say they have several good loading machines on the market but there is no extensive use of them.

MR. DALY: They are all too large for the greater percentage of metal mining operations.

CHAIRMAN ROBERTS: I just saw Mr. Needham, president of the St. Paul Coal Co. and the Republic Coal Co., and a few others, who was going to leave, and I gave him the high sign to wait because I wanted him to tell us something about his difficulties with loading machines. It is a big subject and we want to try to do something for the men who have spent many thousands of dollars in producing these loading machines. Possibly we had better adjourn then until 2:30.

MR. DALY: I believe the manufacturers of loading machines don't realize the field that they will have to work in if they will develop a type of loading machine for a metal mine, of small latitude.

CHAIRMAN ROBERTS: In the meantime we will telephone down to the manufacturers at the Coliseum and try to get them up here at 2:30, and give them a chance to answer our questions.

The meeting then adjourned at 12:15 p. m.

(Note. The following discussion on loading and mining machines is taken from the proceedings of a joint session of coal mining and metal mining branches Wednesday afternoon.)

CHAIRMAN ROBERTS: When we adjourned this morning it was with the understanding that we would meet at 2:15 to allow a few minutes to continue the discussion of mining and loading machines.

There are two or three gentlemen present whom I should like very much to have give us a brief talk on the possibilities of the loading machine, not necessarily on the standardization of loading machines, but more particularly on what can be done to enable us to make a larger use of loading machines. In other words, if the industry as at present conducted and according to the present operations, does not make the proper and largest use of loading machines, we would like to have that go into our record; and also information about anything that can be done that will enable a larger use of loading machines. That information will be of value to our Committee in pursuing their work.

I would like to have Mr. Needham discuss this briefly, making any suggestions he can. Mr. James Needham, president of the St. Paul Coal Co.

MR. JAMES NEEDHAM: I made the statement in the Conference in Denver last year that we have in Northern Illinois a problem that is very difficult to solve in the matter of loading appliances. As far as I know, there is nothing on the market now that would meet our conditions. I was rather hopeful that, when the matter was brought to the attention of the manufacturers last year, something would be attempted, but as far as I know nothing has.

I do not believe that I have any suggestions to offer. The only things that I have tried out (and I have tried some in a crude way) have all met with disaster. That is, they have not been satisfactory or practical. The drag system seems to be altogether unsuited to our conditions. We have a space about three feet square at the face in which any machine would have to operate, not more than three feet, and to be of material benefit to us it must convey coal a matter of 100 feet. Mr. Smith says 150 feet, but in any event not less than 100 feet and through an opening about three feet square.

If anybody can give any suggestions as to a possible solution, I am sure I would be very glad to take advantage of it. Anything that we have tried or seen appears to us to be impractical.

MR. LEVIN: I would like to know a little more about what the conditions are? Is it a semi-long wall system?

MR. NEEDHAM: It is a long wall system.

MR. LEVIN: What is the length of the face?

MR. NEEDHAM: It is circular, and continuous.

The advantage to be gained by any loading device is not merely the question of getting the coal into the cars so much as it is the elimination of brushing. We now have to brush each roadway a matter of three feet and these roadways are driven every 42 feet. So any loading device would have as its main economy the elimination of brushing.

MR. LEVIN: Where is this mine located?

MR. NEEDHAM: All Northern Illinois mines, and of course Kansas and Missouri, to a greater or less extent.

MR. DALY: In order to get the metal mining part of it before the meeting I think some of the gentlemen present this afternoon who were not here this morning should know the requirements of a metal mine. We thought our requirements were a bit difficult but I find your requirements are more difficult. We would not have to meet a condition of that kind in metal mining.

What I had in mind for metal mining, particularly for fissure veins, would be a shovel small enough to be transferable without disconnection on a cage in a shaft that is 4½x5 in the clear of timber. It would have to operate in a drift or cross-cut about 5x7 feet. There is no long pull from the shovel. We would not require that. We would carry our car right up against the back end of the loader.

What I am trying to encourage from the metal mining standpoint is the development of a satisfactory shovel that will load from a cross-cut or drift 5x7 feet and throw it into a car immediately behind the shovel.

MR. LEVIN: You refer to a shovel right along. Why should it be a shovel? Wouldn't any other device do just as well?

MR. DALY: I would welcome any other device that would be satisfactory. I merely mentioned the shovel in a general way. If it will put the rock from the face into the car, that is all I want, whatever the device may be.

MR. LEVIN: I want to ask a question. Suppose a small, compact conveyor was made that has a horizontal part about six inches high or so, and elevates the coal into the car?

MR. DALY: This is metal mining, not coal.

MR. LEVIN: I know that. Are those piles very steep ordinarily after it is shot?

MR. DALY: They are not steep; they are flattened out.

MR. LEVIN: I had an idea that a simple machine might be made that would be simply a conveyor.

MR. DALY: What would be the principle of the loading part, a drag or push?

MR. LEVIN: Just an ordinary conveyor that carries the coal up into the car. Put the nose of that conveyor against the pile and scrape it down, pull it on with a scoop and shovel the last of it. It is much easier to shovel onto a conveyor that is about six or eight inches high and then to lift the coal into the car. Such a machine could be made that would weigh only about 2,000 pounds and be a very inexpensive machine, easy to move about the mine.

MR. DALY: Do you think that the drag method would be as successful as the push method?

MR. LEVIN: I don't know.

MR. DALY: That is a point I would like to make.

CHAIRMAN ROBERTS: He is not figuring on the machine doing any shoveling. He wants to know if it would pay, in your application of the loading machine to furnish you a machine that, after you had shoveled the material onto the conveyor, it would do the loading for you.

MR. DALY: That would not be of any value because, if you shovel it onto the loader you can shovel it onto the car just as well.

CHAIRMAN ROBERTS: You didn't get his point. He thought it was cheaper and easier to pull the coal onto a conveyor six inches high than to shovel into a car three feet high.

MR. DALY: That would not be of sufficient importance. The loading of metal in a fissure vein is onto a small type of car from seven-tenths of a ton capacity up to a ton, and the height of the car is only about 34 inches above the track. So it could be shoveled almost as easily, so far as economy is concerned, into a car as a conveyor. The difference would not be sufficient to warrant the installation of any conveyor.

What I had in mind was a mechanical device that would shovel that rock into the car.

MR. LEVIN: We get the same answer from the coal operators. We can actually prove that it will do away with half the labor, speaking conservatively, but they say that they want something that will do the whole thing.

MR. DALY: That is it exactly.

MR. LEVIN: The time has not yet arrived when we can do that because the mines have not been systematized and their men have not been organized so that such an ideal machine can be used. Therefore, I advocate doing the best we can at the present time, and that is to use a simple contrivance like this that would actually cut the labor by half. In any other business they would consider ten per cent reduction of labor a very good thing. Here we actually lessen the labor by half and they will not listen to it.

MR. DALY: I will have to take exception to the statement that it will reduce the labor half by means of that kind of a thing; it can't be done.

MR. RICE: Before we pass away too far from Mr. Needham's problem, I want to say that I have some familiarity with his problem, inasmuch as I have acted in the capacity of engineer and superintendent of mines in the northern Illinois field and know something of the difficulties that he speaks of.

In my experience in visiting the various places, I think that what comes nearer to solving this problem (and yet I can't say positively that it could be satisfactorily worked out) is the system which they are using in Scotland where they are working in coal beds from 16 inches to 2½ feet thickness, and are using a conveyor for the purpose, a trough conveyor which can be separated at intervals and dragged diagonally through the timbers. They have a systematic timbering there as they are required to have generally in England. The posts are about three feet apart and they use straps, as we would term them, over the two posts 6 feet long and sometimes they are hitched into the coal face. A temporary post is set up under the free end close to the face until under-cutting is done.

The conveyor is between the line of props and the permanent props and the one behind. It runs from there to what they term their gate or where the cars are running. The bottom is brushed in that case and the conveyor discharges into the cars. The face is made in the step form so that the cars are ahead of the face, and the coal is loaded by hand onto the conveyor.

The great gain is that the conveyors are about 300 feet in length, so that they do away with the several intermediate gates, or as we would call them in the Northern Illinois field, rooms or branches, and in that way lessen the maintenance. The system was working very efficiently when I saw it in 1911, and I understand it has been since. Col. Wilson, the British representative who came to our conference at St. Louis on the standardization of mine apparatus, spoke of their successful use. He had been until recently working in the Scotch district.

It is very difficult to compare, from my observation in the past. They have made a point over there in their long wall work—William Garfield has written quite a little about it in his mines—of the importance of keeping a straight face for long wall work. I mean a straight face as far as any piece of long wall work is concerned. He has made his

cut such that he is able to put into the new line of posts and he intensifies his speed.

The speed in the long wall mines worked by hand has in the past been too slow. It is very likely to bury the machine in case it didn't go in fast enough.

In their thin beds they have used these conveyors, and Mr. F. M. Warren, the electrical engineer of the Delaware, Lackawanna & Western mines, who was in my party, was so much interested in the use of the conveyor which he saw there, that he has adopted it for the anthracite beds in Eastern Pennsylvania.

I think that there is a great deal that can be done in that way. It is a question of very systematic work, but the Scotch are certainly able to handle it admirably in the mines that I saw.

With regard to the saving, I think I can say that it isn't alone a question of saving ten per cent of labor. You have got to consider the cost of the machines in the metal mines; you have got to consider that the wear is very terrific and I think that Mr. Colburn can give you some very interesting information about his visits throughout the country on behalf of the Bureau of Mines. He found in many places where the machines are most important because of the scarcity of labor at the particular time; but the repairs on the machine with the grit and cutting on the bearings was terrific. The first year they went all right but after a while the wear was so great that it became a very serious problem as to whether they paid.

MR. NEEDHAM: I will say for the benefit of the gentleman who spoke a moment ago, it will be quite an item to us to have the coal delivered, even though it has to be shoveled into the car afterwards. That is not our difficulty. As Mr. Rice intimates, the big item of expense which we would avoid is the brushing of the respective roadways in this territory which we could cover by the 100 or 150 feet where we now drive them 40 feet. It would be quite an item if we could eliminate that brushing, even though we had to shovel the coal into the conveyor after we got it to the head.

CHAIRMAN ROBERTS: All the recess hour I have been trying to locate Mr. Whaley. He has just gotten my message and has arrived. Before Mr. Colburn spoke I wanted him to reply, while these inquiries were fresh in his mind. He has listened to this discussion. Mr. Whaley is a manufacturer of a loading machine and I would like now to call on him.

MR. WHALEY: I was not here during all of the discussion and I have not the question clearly in mind as to the information that is wanted.

CHAIRMAN ROBERTS: Mr. Needham, will you put the vital question that must be solved in order to make the loading machine applicable to your conditions.

MR. NEEDHAM: We operate on the long wall system using the 45 degrees in the complete circle. The timber is set about three feet from the face, and we are using now a cutting machine with a four-foot cutter bar. The roof is strapped. The space between the face and the first set of timbers must be kept to three feet with practically a three-foot seam, and we would want the coal conveyed a minimum of 100 feet or 126 feet to make the three room widths. We don't think anything less than that would pay, and some think that the coal ought to be conveyed at least 150 feet. That would be on each side and would leave three feet from roadway to roadway, taking half of it from one roadway and half of it from the other.

We would not object to the coal being shoveled into the conveyor, and reshoveled into the end of the conveyor if necessary. We think, however, if the coal can be conveyed to the roadway, that provision can be made to load it into the car, but that is not our difficulty. Our diffi-

culty is getting it from these remote parts of the face through this narrow channel on to the roadway where it can be loaded into cars.

MR. WHALEY: What is the thickness of the coal?

MR. NEEDHAM: Thirty-six inches—from 30 to 40 inches.

MR. WHALEY: As I understand it, we have a space of three feet between the face of the coal before it is shot and the timbers, and after it is shot we have a space of seven feet in which the loose coal lies.

MR. NEEDHAM: It is not shot—I forgot to mention that. It is taken down by hand. The pressure operates to break the coal down, and we get it by hand.

MR. WHALEY: Well, sir, I think that a loading machine man would have a hard job helping you out.

MR. NEEDHAM: I agree with you.

MR. WHALEY: It looks to me as though that is a conveyor proposition and to put the coal into the conveyor by hand. As far as my limited knowledge of the subject is concerned, I think that that is the only present solution.

MR. NEEDHAM: If you will permit me to interrupt right there, I would like to say a conveyor could be built—there is no question about it—to convey that coal out through that channel. Our idea is to handle the conveyor after the coal is loaded out and the machine comes through. That is where we can't see our way clear. It must be of sufficient flexibility to practically eliminate it after you get through loading the coal, because the machine comes through and takes practically all the room.

MR. WHALEY: Well, sir, the machine can't take over three feet, can it, between the face and the props? The machine takes up three feet between the face and the props, as I understand, and there is no room for the conveyor there. The only solution that I can see of that would be a conveyor in short sections which can be put together between the row of props and the coal after cutting is done. Another solution, I think, might be to have a conveyor back of the first row of props, moving the coal over to the conveyor between the first and second row of props.

However, I might say, Colonel Roberts, that this is a little bit outside of the province of the loading machine for we would not attempt to attack that as a loading machine proposition. That is a loading system problem all right for conveyors and the proper arrangement of same.

MR. DALY: On behalf of the metal mines I perhaps could give you something to work on. There is a vast field for a small shovel in metal mines if one could be developed to operate successfully and economically. Our conditions that would have to be met would be a shovel small enough to put on a cage and transfer from level to level without disconnection. The shaft averages about 4½x5 feet in the clear of timber. Of course the cage takes up some room and you would have to figure on a shovel small enough. It also has to operate in a drift or cross-cut five wide and seven high. That would be more in your line.

MR. WHALEY: As I understand it, the machine could not be over 5 feet long?

MR. DALY: It could not be that length; four and a half would be the maximum length and about 36 inches wide and about four and one half long.

MR. WHALEY: What size material are you required to handle?

MR. DALY: Up to nearly a foot cube.

MR. WHALEY: That looks like another case where your limitations of space require so small a machine that it is imposing a herculean task upon a pigmy.

MR. DALY: The dipper can be made smaller in proportion so that there will be more dippers to fill a mine car than the larger shovels at the present time.

MR. WHALEY: That type of machine would have to be a machine, gentlemen, that would deliver direct to the car without the use of conveyors, unless the conveyors were of such a nature that they could be folded up readily.

MR. DALY: This shovel could run on the track right up to the face and the car immediately behind it so that the duties to perform would be to load that and throw it back into the car.

MR. WHALEY: I judge that most of the gentlemen present are familiar with the different types of loading machines now on the market.

MR. DALY: But they are all too large for us.

MR. WHALEY: But the type of machine to be developed along the lines you require, to be four and a half feet long and to be small enough to work in a drift five by seven, would have to be not over four feet wide and not over five feet high. The types of machines now developed are the machines with a swinging boom such as the Thew which is somewhat like an ordinary steam shovel——

MR. DALY: That is a little too large.

MR. WHALEY: Or the Armstrong shovel that passes the material directly back from the ground into the car.

MR. DALY: That would be the ideal shovel for us to use.

MR. WHALEY: I am inclined to think so, too, although that is not the type of shovel that we manufacture. The Myers-Whaley is an automatic shovel which picks up the material and delivers it to a conveyor which carries the material back into the car. There are three different types of machines. I would suggest for these conditions, the limitations suggested here, the shovel loader is a machine that could be developed.

MR. DALY: I have looked into all the shovels. The principle of operation would be to fill the bucket or dipper by a push movement and throw it back over itself into the car behind it.

MR. WHALEY: It is not difficult for other types of machines to meet your requirements as regards to size of drift. We have a machine now that can be operated in a drift five and a half by five and a half and has a capacity of half a ton per minute; but that machine is about 18 feet long and could not be lowered from one level to another as expeditiously as you require.

MR. DALY: You see in a lot of the metal mines there is not enough work on one level to keep the shovel busy. If the shovel were small enough that it could do its work on one level and then go down on the cage to the next and complete another job or two down there, that would be the ideal shovel. For instance, in the Butte district on the Anaconda properties, to put one shovel on each level in each mine would probably take four or five hundred. The interest on the investment would more than eat up the saving that would be made by the shovel.

MR. WHALEY: You have a very small tonnage to handle in any one place. The machine would only be working for a short time.

MR. DALY: Where the operator could take his machine to one face and load it and keep it going—that is the ideal machine that we would like.

I mentioned those conditions to let the manufacturers think it over. There is a vast field for it if you can develop it.

MR. NEEDHAM: I want to add one more thought. The machine that strikes me as having the greatest possibilities is one with some sort of a reciprocal conveyor (if you get what I mean by that); any continuous conveyor which you would have to take apart would be, I think, a failure. It would be subject to more or less strains and curves, but a reciprocating conveyor, one which moves with movable parts, to come back and get the coal and keep feeding it, would be the correct principle; but I have not been able to get anything that seemed to be practical. However, the manufacturers may work something out on it. That would give you really nothing then but a shaft, just a plunger which would

keep moving, and you could manufacture something that would stand some curvature, some inequality and would still keep itself confined to the simple trough which would be necessary to convey the coal.

MR. LEVIN: I wish to state that there are such conveyors used in England and Scotland very extensively. So that there would be no trouble to furnish conveyors of that kind if there was the demand for them. We have not had any call for anything of that kind otherwise we would have built it and we can build it at any time. There is a firm in England that makes them and another one in Glasgow. There are two or three firms in England that make that kind of equipment.

MR. COLBURN: From what has been said so far, I believe it is a little pessimistic for the underground loader, but I hope to make my remarks a little bit more optimistic. If you stop to review the field a minute, you will find in the United States today we have a number of different kinds of problems for the underground loading device. For instance, Mr. Daly has said that he wants a loader that he can take down his shaft and use in various parts of his mine. Well, I would like to tell Mr. Daly that one of the mining companies in this country is today using such a loader. He can take it down any one of the operating shafts of the Anaconda Mining Co.

We also hear that we need a loader that will transport material 100 feet. I would like to tell the gentleman that there is a loader in operation in this country today that is transporting material 200 feet.

In reviewing briefly the underground loading device bear in mind first that in some cases you have to have a loader that will handle large pieces of material; in some cases they handle rocks that are as large as a barrel; in other cases you will find that the material is very fine, and in some other cases you will find that we have to handle the material delicately. You don't want to break up the material. In some cases they like to have it broken up. Coal mines like to mine lumps instead of dust. Metal mines like to have it broken up. It saves crushing.

As a general rule, the mines of the country are not laid out to use loaders. They are laid out to use man-power. The study has been carried on in certain localities to solve certain problems. That is why we find so many different kinds of machines. To date you will find machines in use in one locality that are not talked of elsewhere. Maybe one mine has developed a machine for their own particular problem and have not put the machine on the market. The Bureau of Mines has been collecting information along this line for a considerable time and getting it in shape to give to the public. We have information about some machines that have not yet been patented. The information has been given to the Bureau confidentially and the Bureau is not at liberty to give out that information, but the two machines that I speak of are in use and are known, and I believe that there would be no objection to giving it out.

I wanted to bring out those thoughts before the subject was closed. On the market today there is the Myers-Whaley machine that is being successfully used by several mining companies that I know of. The shovel loader is also being successfully used. There is a machine invented by a Mr. Hunt that is being successfully used. There is a machine known as the John Mahin Sub-level Loader that is being successfully used.

I have seen the Marion shovels down in a mine shoveling material. The Thew is used in mines successfully. This Keystone grader that you see out in the street, that has been used by the contractors in loading dirt on a road, has been adapted to underground use and is being successfully used. In addition to this there is a scraper, which is known in some places as a "slusher," that is being successfully used.

There are some other machines that are also being used that I will not stop here to mention, but this is a big subject, a big problem and will

probably take two or three conferences of this kind to bring out all the information.

MR. NOTMAN: The thought that has occurred to me as a metal miner is this: we have been faced with somewhat the same problem as Mr. Daly has already described, and our conclusion was that if we could successfully maintain a shovel such as the shovel loader under full load, that we would make very material economies; but in a drift or cross-cut five by seven feet, it is impossible to give such a machine adequate service without delays which prevent working at capacity, and the amount of material to be handled before moving the shovel is not sufficient to show any real economy over hand labor where you can only deliver one car at a time.

The problem of the metal mines may not be so much a question of manufacturing the right kind of equipment as it is modifying their design of drifts and cross-cuts so that they can maintain adequate car service. I think that the industry itself rather than the manufacturers should investigate possible economies by widening their drifts so that they would have to break more ground but could get rid of it more cheaply.

MR. McCLOUD: I think this subject of underground loading, particularly in coal mines is of very large interest to the coal miners. The company that I am connected with has been investigating the subject of underground loading for two or three years. We have attempted to assist some in connection with improvements and developments of some of these loaders.

It seems to me that the problem of loading must be subdivided between coal loading and metal loading. I doubt if any one machine can be developed that will meet the needs and requirements of both. We know in some cases there is sufficient headroom to use the Thew shovel. We know in other cases in metal mining that it requires a small, compact machine.

In the mining of coal there are some mines in the West that can use the Thew shovel in loading. The majority of the mines, however, in bituminous work, don't have sufficient headroom to use a machine of that type. They must use a machine that has a minimum headroom. If any machine is going to be developed which is going to have a universal use, it must be produced in large quantities and at a reasonable price, because the coal mining people have small capital in many instances and have a reluctance to try out a thing of that sort.

As a result of our investigation we have figured in our mines certain limitations in regard to loaders that would be applicable to coal mining. That is, in many mines you only have three feet of headway. We feel that a machine should be able to work within three feet headway, and that it should be substantially the size and weight and price of a gathering locomotive. If you are going to run into rooms, it must not be too heavy upon your ordinary standard rails; and we feel if it is higher in price than a gathering locomotive it won't have a ready sale. In other words, the more universal demand and the greater the sales, the more money can be expended in experimental work and development.

There are many machines on the market that we have investigated, some of them in actual trial and some of them by analysis. Most of those machines will load more coal than can be ordinarily handled in cars. The limitation is not on the machine itself; it is in the matter of getting away cars from the machine. In other words, we believe that in order to utilize a loading machine to advantage, you have got to develop a system of loading, that you have probably got to arrange your mines so that you can have a series of loaders, and if that work can be systematized with a crew that is going to go ahead and do the cutting, follow up with the shot-firing, follow up with the loading and

work in rotation on a system of rooms, then you are going to utilize the machine to its full productive capacity.

The limitation is in the handling of the cars with the present system of mines. The machine must be made serviceable; it must be made simple; it must be as dustproof and foolproof as possible. It must not be complicated so that you have to take it to the blacksmith shop for repairs. An ordinary operator must be able to make ordinary repairs.

It seems to me a great deal of money might be saved and a great deal of development be made by having this matter followed up perhaps a little more persistently and thoroughly by sub-committees, subdivided so that one will investigate the conditions of loading in metal mining and the other in coal mining. If those committees make a brief digest of the characteristics and classifications and limitations of the present types of machines and make a statement or description of the average methods under which those machines must be used in the two industries, it will be of great help. No one machine is going to fill all requirements under all circumstances. It must be built for the average and adapted as nearly as possible to the other conditions.

If that were done, a considerable amount of information of an unbiased character could be gathered together, given to the manufacturers, given to the members of the Mining and Loading committee of this Congress, and I believe that it would assist very much in going ahead with the development of the machines that are necessary to meet the average conditions of loading.

If any machine can be developed we believe one that will handle 50 tons of coal a day with two men will be a paying proposition, if it does not cost too much money and the maintenance and upkeep is not too great. If you can develop a system of mining and a systematic crew which will enable it to handle 100 tons, so much the better.

If you have committees on this work, it seems to me that we ought to go ahead and continue to work along those lines. There are big possibilities in the loading. The majority of coal operators will adopt the loader if it can be made a paying proposition and if it is a machine that can be used regularly under the conditions they have to meet.

MR. A. M. CAMERON: I just want to say a word to the coal men. The coal mining industry is under condemnation at this time on account of certain statements that have been made in periodicals that have a high standing in this country. If you will look at the September Atlantic Monthly—which I think you will agree is a very high-class periodical—you will find an article in that issue about the coal business that you should read. All the Senators read the Atlantic Monthly; the Congressmen read it; the bookkeepers read it; the clerks read it; but the miners do not read it.

In that issue you will find an article by, I think, W. N. Sumps, who states that the reason for the high cost of coal to the consumer is that the coal miners and the coal operators have not developed the machinery to load the coal from the face into the cars. I don't want you to miss this, because it is a subject that is now before the public. He makes the statement that we might just as well attempt to raise the billions of bushels of wheat in our western states by turning up the soil with pick and shovel as to attempt to load 600,000,000 tons of coal a year with the present method.

He went on to state that at the present time it costs 89 cents to put a ton of coal into a mine car and with the present system of mining machinery and mining operation, production engineers have told him it could be done for 15 cents a ton.

Are we under condemnation, or are we not? I think it is a vital question, Mr. Chairman, and a broad one and a big one and I think it is probably just in the wrong place in this meeting on standardization; but if there are any machinery men here, or any production men here

who have the machinery that can load the coal for 15 cents a ton into a mine car, you can find a welcome at every mining office in the state that I hail from—Pennsylvania—and I think the same thing would be true with the metalmen.

MR. RICE: May I just say one word, because you asked me this morning to speak on this subject. You then coupled up the importance of the method of mining in connection with machines. I think the discussion this afternoon has brought that out very well, that you cannot really properly give the whole problem to the machinery man. It has been pointed out by one of the preceding speakers that it is absolutely important to be able to take care of the coal and mineral which is furnished by the machine. If that is not taken care of, the machine is not going to pay.

In the case I spoke of in these very thin beds in Scotland (and it has been tried in several mines in this country), they made the point that they must have the method such that they could bring the cars to the loading device, the conveyor in this particular case, by carrying double tracks and carrying it on beyond the point of loading, so that they can quickly switch the train of cars out.

CHAIRMAN ROBERTS: While the subject is one of vital importance, we have our regular program to complete, and therefore we can't give any further time to this subject, as much as I wish we could. However, we have accomplished what we wanted to do: and that was to show to these committees (we have such a committee both in the coal mining branch and the metal mining branch) the possibilities that lay before them.

I think the suggestion made by one of the speakers is a good one—that this Committee on Mining and Loading should be subdivided into several sectional committees. Let one committee take up the question of loading, and another take up the question of mining, etc. We could even further divide the work of the committee on loading, making a division for the problems of the Northern Illinois long wall system, and the other districts where conditions are very dissimilar, and where a machine that was developed to suit one condition would not be applicable to another at all.

MR. McCLOUD: I would like to say one more word in that respect. A decision should be reached by the committee as to whether or not it is advisable that the machine that is developed to meet the conditions should be a loading machine that actually pulls the coal down after it has been shot and is hanging there keyed up, or whether it is merely going to be a machine to load the coal after it has been spread out on the bottom. There is a divergence of opinion in that respect.

My personal opinion is that any machine that can be built within a reasonable weight and reasonable size and reasonable cost will not withstand the wear and tear of attempting to pull the coal out after it has been shot. The machine should be primarily a loading machine. It takes up too much energy and wear and tear to attempt to make it a pulling down machine as well as a loading machine.

The advantage of the committee making a report to the manufacturer is this: I have had a number of loader manufacturers come to us to get some information as to what conditions they have to meet—in one place they have one peculiar condition and the man says, "This is what you have got to meet." In another place they will go into another mine—if they get any reception at all—and there is another condition. The committee should decide and give their opinion as to what the average conditions are. In that way the machine to be developed will be universal in its use and not particular.

CHAIRMAN ROBERTS: This committee on Mining and Loading Equipment is composed almost equally of representatives from the manufacturers and representatives from the operators, and with this information before them, being a combined committee, they ought to be able

to thresh this out and give us something constructive within the next few months. They, of course, will have to meet the conditions as they find them. Mr. Needham has stated that, in the Northern Illinois field, they will be entirely satisfied with a machine that will load their coal after they put it on the conveyor, as he calls it. That would be such a help to them that they would welcome that kind of a machine. Another operator with a thick seam of coal easily loaded would not be satisfied with that. He may be a big tonnage operator and he wants to further reduce his costs. The machine that Mr. Whaley builds and is marketing will meet those conditions.

What we need is a comprehensive review of this whole subject, based on the discussion at this conference, and then a constructive report which in all probabilty will tell us that we will have to modify our mining conditions in certain instances to get the best and largest use of any loading machine. No doubt the operators will be perfectly willing to do that if we can show them that it will pay them to do so.

I think this is all the time that we can possibly take for this subject, as we have several reports to review this afternoon.

Discussion of these reports will be found on page 711 in the Wednesday afternoon proceedings.

JOINT SESSION METAL AND COAL MINING BRANCHES

WEDNESDAY, OCTOBER 19, 1921—10:30 A. M.

COL. ROBERTS: The program, you see, states that the Chairman of this Joint Session will be Mr. Charles A. Mitke. He is in South America, and Mr. Notman, the chairman of one of his committees, will have charge of this meeting on behalf of Mr. Mitke, and I will now turn the meeting over to him. (Applause.)

CHAIRMAN NOTMAN: Our first address is on the "American Engineering Standards Committee and National Standardization," by Mr. A. A. Stevenson, President of the American Engineering Standards Committee, and also Vice-President of the Standard Steel Works Co.. In his unavoidable absence, Dr. Agnew, the Secretary of the American Engineering Standards Committee, has kindly consented to read Mr. Stevenson's address. Dr. Agnew.

DR. P. G. AGNEW: I first of all want to present Mr. Stevenson's personal regret at being unable to attend this meeting. It was hoped that the Vice-Chairman, Mr. Stone, could attend, but it was found that a previous appointment interfered.

THE AMERICAN ENGINEERING STANDARDS COMMITTEE AND NATIONAL STANDARDIZATION

By

A. A. STEVENSON, CHAIRMAN, AMERICAN ENGINEERING STANDARDS COMMITTEE

At the Standardization Conference of the American Mining Congress on November 17, 1920, the Secretary of the American Engineering Standards Committee, Dr. P. G. Agnew, outlined briefly but in a comprehensive manner, the scope of the work of the Committee, the economic and industrial significance of the work, its organization and methods, and the machinery established for international standardization. As stated by the Secretary, the American Engineering Standards Committee is solely an administrative and policy-forming body and does not concern itself with technical details, its function being to assure that each body or group concerned in a standard shall have opportunity to participate in its formulation. The actual work of preparing the standard is placed in charge of a so-called "sectional committee" made up of representatives designated by the various bodies interested, the personnel of each sectional committee being approved by the American Engineering Standards Committee as being authoritative and adequately representative of the various interests concerned.

In view of the presentation of the facts by Dr. Agnew, it seems unnecessary at this time to enter into details relating to the organization and work of the American Engineering Stand-

ards Committee, but it is believed that The American Mining Congress will be interested in learning of the developments that have taken place during the past year, with particular reference to those which affect directly or indirectly the mining industry. The fact of the matter is that I feel assured that The American Mining Congress will be interested in the developments taking place under the auspices of the American Engineering Standards Committee because I was fortunate enough to preside at the preliminary conference of the mining industry at which the subjects mentioned were discussed, which conference resulted in the formation of the General Correlating Committee for Mining Standardization; I know the efficient work that has been accomplished as a result of that conference, and the services rendered to the mining industry by those who attended. I think I will not now be violating confidence in stating that several times during the preliminary conference I felt a trifle discouraged and wondered whether or not any satisfactory results could be obtained; but subsequent developments have shown that the discouragement on my part was unwarranted. The situation which there developed and the later results bring to mind what Thomas Jefferson is reported to have said, "The things that worry us most are those that never happen."

When the address of Secretary Agnew was delivered in 1920 the American Engineering Standards Committee had approved three standards. At the present time the list of approved standards contains a total of twelve. In addition to these, fifteen existing standards have been offered for approval by the Committee which now has them under consideration.

In view of the fact that the Committee has been in existence for two years, the list of approved standards may appear extremely small. However, the chief function of the Committee has thus far been and will continue to be for some time, not so much the approval of existing standards or the creation of uniform standards as the elimination of conflicting standards. Its work to date has been concentrated more on creating organizations ("sectional committees") to determine what should be promulgated as the proper standards for the American industries, than upon selecting from the existing conflicting standards certain outstanding ones and designating them as "American." Its problems have been, and will continue to be, not technical, but human; to insure such a degree of co-operation among all organizations of each industry interested in a certain group of standards through the medium of sectional committees that they will agree in advance of the promulgation of any standards that they will adopt, as their own, such standards as are formulated by the sectional committees and approved by the American Engineering Standards Committee.

Numerous sectional committees (with personnel approved by

the American Engineering Standards Committee) are now at work upon the technical details of standards to be submitted to the sponsors and later to the American Engineering Standards Committee when approved by the sponsors. Work is now actively under way on about sixty projects which have reached an official status.

Mention should be made in this connection of certain sectional committees organized during the past twelve months, including the "Rating of Electrical Machinery," for which the American Institute of Electrical Engineers is sponsor; "Terminal Markings of Electrical Apparatus," for which the Electric Power Club is sponsor; "Pipe Flanges and Fittings," for which the American Society of Mechanical Engineers, the Heating and Piping Contractors National Association, and the Committee of Manufacturers on Standardization of Fittings and Valves are joint sponsors; "Standard of Aluminum for Conducting Purposes," for which the American Institute of Electrical Engineers is sponsor; and "Electrical Equipment on Shipboard," for which the American Institute of Electrical Engineers is sponsor. In addition to these there have been organized a number of sectional committees to deal with safety codes, the program for which has been recommended to the American Engineering Standards Committee by the National Safety Code Committee, which is acting as a general correlating committee on safety codes. As the result of recommendations made by the General Correlating Committee for Mining Standardization sectional committees are being organized to deal with "Electrical Equipment in Bituminous Coal Mines," "Portable Electric Mine Lamps," and "Storage Battery Locomotives for Use in Gaseous Mines," for each of which the Bureau of Mines will serve as sponsor.

In addition to the projects just mentioned, attention should be directed especially to a number of other projects initiated in a different manner. The American Engineering Standards Committee "Rules of Procedure" contain a section in which it is stated that upon request from a responsible organization the American Engineering Standards Committee shall, by a conference of the bodies interested, determine the desirability of undertaking the development of the proposed standard, and if the development seems desirable, may designate a sponsor, or sponsors, for the work. During the past twelve months as the result of such conferences, ten organizations—the American Electric Railway Association, American Institute of Electrical Engineers, American Railway Engineering Association, American Society for Testing Materials, Associated Manufacturers of Electrical Supplies, Association of Edison Illuminating Companies, Association of Railway Electrical Engineers, National Electrical Light Association, National Fire Protection Association, and Underwriters' Laboratories, have been designated as joint sponsors for "Unification of Specifications for Insulated Wires and

Cables"; and the American Institute of Architects, the American Institute of Electrical Engineers, and the American Society of Mechanical Engineers have been designated as joint sponsors for elevator standards; and the American Institute of Architects, the American Institute of Electrical Engineers, and the National Association of Electrical Contractors and Dealers have been designated as joint sponsors for "Symbols for Electrical Equipment of Buildings and Ships"; and the Bureau of Standards and the Society of Automotive Engineers have been designated as joint sponsors for a Safety Code for Aeronautics. The American Railway Engineering Association and the U. S. Forest Service have requested that the American Engineering Standards Committee call a conference on Railroad Tie Specifications, which will be held on October 25, 1921; and the Association of Edison Illuminating Companies has requested the calling of a conference of interested bodies to determine whether the unification of definitions, symbols and abbreviations, especially in electrical literature, should be undertaken.

Experience has proved that the conference method of initiating the unification of standards possesses many advantageous features, while its disadvantages practically do not exist. When men get together in a conference of this kind and interchange ideas concerning the proposed unification in standardization, they obtain a comprehensive view of the whole field; harmony emerges from discord, and differences disappear in agreement. Incidentally they obtain a better understanding of the function of the American Engineering Standards Committee and a more perfect appreciation of the results it is aiming to accomplish.

From the international viewpoint the American Engineering Standards Committee is recognized as being the one organization qualified to speak for national standardization in America. It was represented as a conference of the secretaries of the national standardizing bodies in London in April, 1921, called by the secretary of the British Engineering Standards Association. The conference had for its object an interchange of experience and the furtherance of co-operation between the various national bodies in their work of industrial and engineering standardization.

It is interesting that, notwithstanding great differences in the details of procedure, the same general method of work is followed in the different countries, namely, technical decisions concerning any specific piece of work are in the hands of a working committee which is so constituted as to be broadly representative, from both the technical and the managerial points of view, of the particular branch of the national industry concerned. This same general method is followed whether the work is of the nature of specifications, methods of test, or dimensional standardization.

The secretaries have submitted the suggestions of the confer-

ence to their respective organizations, many of which, including the American Engineering Standards Committee, have already voted their approval. These suggestions dealt with the interchange of publications, a reciprocal arrangement for making foreign standards available to the industries of each country through their sale by the offices of the national bodies, the exchange of information as to the status of work in progress, and other methods of furthering co-operation between the national bodies.

As chairman of the Committee I feel that our secretary's trip to Europe to establish personal contact with similar organizations in other countries and learn of their methods has been of exceptional value not only to the Committee but to the numerous industries in this country. I consider his report on Industrial Standardization in Germany of such value to the industries of America as more than to cover the whole cost of his trip.

Developments during the two years of its existence have shown the desirability of making certain changes in the Constitution and Rules of Procedure of the American Engineering Standards Committee, but I am thoroughly convinced that basically its methods are sound and must result in the production of standards that are truly American. This fact is appreciated not only by the organizations actively co-operating in the work, but by certain other groups that have adopted in its essential details our method of doing business. Incidentally, some of our own member-bodies have altered their methods of producing standards so as to conform to the procedure of the American Engineering Standards Committee.

Not by the number of standards produced, but rather by its success in bringing about industry-wide co-operation in the unification of standards, must the American Engineering Standards Committee be judged.

CHAIRMAN NOTMAN: Gentlemen, you have heard Mr. Stevenson's very interesting address as read by Dr. Agnew. I think it might be well for all of us who are on Committees of The American Mining Congress on Standardization to take a leaf out of their book in our methods of procedure, and also not to be too discouraged when we don't succeed in promulgating a standard every five minutes. If we get one or two each year, I feel that we will be accomplishing a great deal.

Some of our sessions have so far, perhaps, not developed anything more than the fact that we ourselves didn't know what we wanted in the way of standards and were not standardized at home, so to speak. I think standardization, like charity, begins at home.

We are going to work Dr. Agnew overtime this morning, and unless there are some comments or discussions of Mr. Stevenson's paper, we will proceed.

COL. ROBERTS: I just wanted to add a few words of explanation that some of the gentlemen present will more thoroughly understand what the American Engineering Standards Committee is. It is the national clearing house for standardization in the United States. All national organizations interested in standardization in any industry, if they want to make their work national in scope, must affiliate themselves with the American Engineering Standards Committee, and most of the national organizations that are doing active standardization work are

affiliated with the American Engineering Standards Committee, as you can find by taking their Year Book and finding the bodies that are connected either directly or as associates in that work.

They have two kinds of membership—the active membership, those who belong to the committee and are directing its work and have voting members on the committee; and those who are associated with the committee. At the present time The American Mining Congress is an associate member. That is, we are clearing through them, but we are not an active member and have no vote in adopting their standards or in passing upon standards that are put up to them for approval.

However, we are actively associated with them through the general correlating committee, which is the national organization for the mining industry and is a subsidiary committee under the American Engineering Standards Committee, and we are an active member of that general correlating committee.

I just wanted you to understand that so you would appreciate the importance of these two addresses—the one that Dr. Agnew has read on behalf of the President of the American Engineering Standards Committee and the one which he will now read as Secretary of the American Engineering Standards Committee.

CHAIRMAN NOTMAN: Is there any other discussion of the paper of Mr. Stevenson's, or of Col. Roberts' explanation of our relations to this committee? If not, we will call on Dr. Agnew. (Applause.)

INDUSTRIAL STANDARDIZATION IN EUROPE

DR. P. G. AGNEW, SECRETARY

AMERICAN ENGINEERING STANDARDS COMMITTEE

It is the purpose of the present paper to present some notes on particular phases of industrial standardization in Europe, rather than to treat the subject adequately or in true perspective. The point of view is that of standardization along national lines, that is in national industries as a whole, the work being carried out through a national standardizing body rather than by individual companies or by technical or industrial associations, without the participation of all interested bodies.

There are now twelve national standardizing bodies in Europe. As might be expected from the industrial importance of the two countries which are our chief competitors, the British and the German bodies are in a class by themselves in the extent and importance of their work. Yet very active and significant work is being done in Austria, Belgium, France, Holland, Sweden, and Switzerland. The national bodies of Czecho-Slovakia, Italy, Norway and Poland have been organized only recently. Outside Europe, there are national bodies in Canada, Japan and the United States.

CHARACTERISTICS OF CONTINENTAL WORK

Looked at broadly, the continental work shows interesting differences in principle from that in Anglo-Saxon countries. With exceptions, such as must always be made in general statements of the kind, the latter have taken much more to such matters as specifications for materials and for performance of apparatus,

methods of test, and other matters having to do with purchase and contract, than have the continental countries. On the other hand, the continental countries have developed dimensional work much further than has been the case in English-speaking countries. (The work in the automobile industry in America is an outstanding exception.) This dimensional work includes not merely the interchangeability of supplies and of machine elements, but also the inter-working of parts and of related apparatus made by different manufacturers, and interchangeability, so far as the users are concerned, of complete machines and apparatus.

The Anglo-Saxon and the continental work differ in another important way. Fundamental theoretical considerations appear to weigh much more, and immediate commercial considerations and exigencies to weigh less with the continental than with the Anglo-Saxon type of mind. As in their politics, the latter pursue an opportunist policy, each project being taken up whenever there is a request from industry for it, and the relations of each project to other work being settled from opportunist considerations. Each piece of work thus becomes a block in an unplanned mosaic. The continentals, on the other hand, are much more apt to place before their working committees a carefully-planned outline of a whole subject, on the theory that in carrying out each piece of work consideration should be given to how it may be made to fit into a planned mosaic, however much the plan of the mosaic must be changed during the carrying out of the work. Both these tendencies are, I believe, slightly more accentuated in the British work than in the American work, while in the Belgian work, the opposite tendencies are less accentuated than elsewhere on the continent.

GREAT BRITAIN

Naturally, the British work is better known in America than is that of any other country. Nearly 150 standards have been adopted and published, many of them having gone through several editions. Most of them deal with specifications for materials along lines somewhat similar to the work of the American Society for Testing Materials, and as in the latter, specifications for metals play an important role. There are a few dimensional standards, the most important of which is that on sections for structural steel.

The work has been a most important factor in the development of British industry. Their manufacturers attach great importance to the role which the specifications have played in the foreign trade situation, and still more to the role which it is planned that they shall play in the future. Recently a large fund was raised to translate those specifications which are best adapted to the purpose into French, Spanish, Portugese and Italian, and to distribute them in strategic foreign centers. The British govern-

ment contributed £10,000 to this fund. Twelve "local committees" have been formed in such countries as Argentine, Brazil, China, Spain, etc., to further this work. These local committees work in close co-operation with the British consulates.

FRANCE

The French national body is organized under the government Ministry of Commerce and Industry. Plans have been made for systematic work in fourteen industries. Over fifty standards have been published in final or in tentative form. The French Chamber of Commerce is taking an active interest in the work. The working committees are made up on the representational plan, the leading industrial and technical bodies participating in the work.

BELGIUM: Several standards have been issued by the Belgian Association. In technical content the work is apt to follow much the same lines as French practice, on account of industrial and linguistic relationships, and the use of the metric system, though commercial intercourse with England has a marked effect. The Association is supported by the national association of manufacturers, the leading technical bodies, and the government.

HOLLAND: The work in Holland is very active. About fifty standards have been issued. They are largely dimensional in character. As in the case of Belgium and Switzerland, the country is not large enough to form an independent industrial unit, and this fact has a profound influence on the standardization work. Holland's chief industrial relationships are with Great Britain and Germany.

SWITZERLAND: Next to the British and German, the Swiss and the Dutch work is the most active and extensive. In one respect the Swiss work is unique. Swiss manufacturing industries depend almost exclusively upon export. As practically all the manufactures, except the watch industry, is in German-speaking Switzerland, the standardization work is necessarily very closely related to that of Germany. It is, as yet, nearly all dimensional. It is supported entirely by the Swiss Manufacturers' Association. Over thirty approved standards have been issued.

GERMANY: The German work is peculiarly interesting on account of its importance and its activity, and also on account of a similarity in the conditions, at the time the work was organized on a national scale, to those in America. Germany is one of the three leading industrial countries. The industries of Austria, Holland, Sweden and Switzerland, are so intimately related to those of Germany on account of geographical and other relation-

ships, that they are necessarily affected very largely by developments in Germany.

Prior to 1917 there had been a vast amount of standardization work carried out by individual companies, and by engineering societies and industrial associations, but it had not been unified along national lines. The central body (the Normenausschuse der Deutschen Industrie) was organized in 1917 at the suggestion of the German government, by the German Society of Engineers. The leading technical and industrial bodies of Germany are now associated with the Society in maintaining it. The organization and methods are similar to those in other countries. The detailed technical work is in the hands of what in Anglo-Saxon countries would be called "sectional committees," i. e., committees made up of representatives of all bodies interested in the particular subject in hand.

The central body handles only those matters which are of common interest to two or more industries. By far the greater part is dimensional. Great attention is being paid to supplies and machine elements such as screw-threads, bolts and nuts, standard diameters, fits, and systems of limit gaging. About 150 standards and 500 officially proposed standards have been issued. They are published in loose-leaf form, a method followed by the Austrian, Dutch, Swedish and Swiss.

The work has become so extensive that in order to keep the various industries in touch with the various phases of it, a periodical publication has been established, in which official proposals, news of the standardization movement, etc., are published. It appears semi-monthly, averages 16 quarto pages, and has a circulation of 8,000 copies. The sale of standard sheets reaches some 100,000 monthly. Firms purchase them in quantity, and put them into the hands of their technical staffs as working drawings and data sheets.

This refers to the work of the central body only. In addition, there are some fifteen organizations, known as "special industry committees," each of which deals with the standardization work peculiar to a single industry. They are affiliated with the central body.

The volume of work being carried out through these special industry committees appears to be at least as great as that under the direct control of the central body.

It has sometimes been stated that the continental work is too theoretical and accordingly does not get into actual use. In the work of the four continental bodies with which I am most familiar, Belgium, Germany, Holland and Switzerland, I have learned nothing to justify such a criticism. The work seems to be woven very intimately into the industrial fabric. In fact, in many instances, it goes much further than would be possible in England or America. For example, complete purchase specifications are now in universal use for distributing transformers, in-

cluding even maximum and minimum limits of efficiency. Similar specifications for certain classes of motors include regulation, efficiency, power factor, and air gap. In some cases motors of all German manufacturers are both mechanically and electrically interchangeable This has been true of motors for mine pumps for several years, and is said to have been of great importance in keeping mines in operation during the war. It has led mine operators to exert pressure to secure complete interchangeability in other kinds of machinery.

It is interesting to note, in connection with the last point, that in both the British and the German work, the impetus toward standardization usually comes from the users, and that its effectiveness generally depends upon their being organized.

There seems to be a striking analogy between the present standardization movement in Germany, and the research movement started there a generation ago. Whatever estimate one may place upon the role it played in German industries generally, everyone agrees that research was fundamental in the development of their great chemical industries. The role which the Germans are expecting standardization to play in all their industries would be not unlike the role which research has played in the development of their chemical industries.

Unquestionably the German industries are planning and are carrying out a far-reaching program of standardization as a necessary step in building up an unprecedented industrial structure which must rest in large measure on an extensive foreign trade.

EXAMPLES OF GERMAN WORK: As typical examples of the German work, their system of "preferred numbers" and their standard series of handles may be mentioned. The first is a fundamental piece of work, founded on theoretical considerations and of the first importance. It is a simple system of numbers for use in all new standardization work, in which graduated numerical values are required, such as standard gradated diameters of pulleys, thicknesses of plates, or capacities of machines. The numbers increase logarithmically (but rounded to even convenient values) so that each differs from the next by a given percentage. If it is decided, for example, that in a graduated series of plates 5 steps in thickness between 10 and 100 millimeters are desirable, then the "5-series" would be used, viz.: 10, 16, 25, 40, 64, 100 mm. For 10 steps, the "10-series" would be used, viz.: 10, 12.5, 16, 20, 25, 32, 40, 50, 64, 80, 100 mm. There are a "20-series" and a "40-series" for still finer steps. For a range from 1 to 10, the decimal point is merely shifted, etc. The Germans believe that the use of these numbers is going to lead to great economies in material, in reducing the number of sizes, ranges, etc., simplify the carrying of stocks, facilitate interchangeability. It may be shown theoretically that, under average conditions, a given number of standard sizes laid out according to these numbers, will be better fitted to any series of jobs taken at random,

than would be the same number of sizes laid out in any other way, and this with a minimum of material.

The standard handles furnish a typical example of German love of thoroughness of detail. There are two shapes, each adapted to a particular method of use, and there is a series of sizes for each shape, laid out according to the preferred number system. The profiles have been worked out with the most extreme care, an efficiency engineer having been employed to make time-motion studies to determine the exact profile that would insure the greatest accuracy in operation with the minimum fatigue of the workman's hand. It is held that by doing a thorough job once for all, different industries and firms will be saved from doing the same thing over and over, but always less well, and that at the same time interchangeability is introduced.

INFORMATION ON FOREIGN WORK: As a result of a conference of the secretaries of national standardizing bodies held in April of this year, arrangements are being completed for a systematic interchange of information between the national bodies as to the status of their various projects. Each will also act as a sales agent for the publications of the other bodies. Thus, through the American Engineering Standards Committee, copies of foreign standards and specifications are readily available to our industries.

CHAIRMAN NOTMAN: I am sure that we have all enjoyed Dr. Agnew's very interesting and stimulating description of Europeon progress in standardization. If there are any questions that any of you would like to ask Dr. Agnew, I am sure he will be ready to answer them at this time.

MAJOR WARD: May I ask the Doctor to explain the standard sheets so largely used in Germany?

DR. AGNEW: The German standards are printed on loose-leaf sheets, a little bit bigger than our standard 8½x11 page. One of these pages, for example, will contain the data for screw threads between two different diameters or for a whole range. Another sheet will contain all of the data on one of these that I have just described. Another will give data on another line. Where standards are too long to put on one or two sheets of paper, they are subdivided.

CHAIRMAN NOTMAN: Are there any other questions?

I personally was very much interested in what Dr. Agnew had to say about requiring the users of special designs to pay for the extra expense of manufacturing. In our own Committee on Drilling Machines we have run into the fact, as told us by the manufacturers, that we don't know what we want as users, and consequently the expense of manufacturing has been tremendously increased by the infinite number of designs that we ask for; and if we are going to make any progress in standardization, why we have got to get together on what kind of equipment we want to use and not allow the individual to run riot with his particular petty ideas.

I presume that all of us have been paying for the experiments demanded by the other fellow as well as our own.

Are there any other questions that you would like to ask Dr. Agnew?

COL. ROBERTS: The object in preparing this carefully arranged program on national and international standardization was to bring to this body not only certain information regarding national and inter-

national standardization, but to bring to you the inspiration that comes from the large work that is being done and of which we are now a part.

It has occurred to me, since Dr. Agnew has answered the last question, to suggest to our Standardization Conference that we might learn a great deal if we would get in closer communication with Dr. Agnew, representing national and international standardization, and when any of our committees have not been able to reach conclusions regarding certain matters, as just suggested by Mr. Notman in connection with his committee which has a very difficult subject to handle, they might learn from the experience of those who have been at this work for many years something that would enable them to reach a conclusion and possibly satisfactory conclusion to the manufacturers. I am particularly impressed with the simple arrangement adopted by the Germans for trying to standardize motors. We have in this country many sizes of motors. Certain of those sizes are used a great deal more than others and when the government was trying to select a few sizes of motors that would be adopted as standard, so that the manufacturers could increase production, we didn't use such simple methods as that, and I don't believe anything like so efficient, believing absolutely in the statements made by Dr. Agnew that those are not just theoretical sizes but they are mathematically correct within those two limits—ten and one hundred.

If we had had this information at that time, it would have saved our committee many hours of labor and we would have possibly arrived at absolutely mathematically correct results whereas ours were by the eliminating method. We eliminated the motors that we thought they could get along without, and finally settled on certain horsepowers that we thought were essential. However, this is a much more positive way of arriving at results than by the method of elimination.

That all impresses me with the importance of this particular program that we have prepared for you and how much we can learn from it. I believe in the future if the chairmen of our committees, whenever they run into difficulties that they seem unable to solve, will get into communication with Dr. Agnew, he may be able to furnish you with information that will make your path very much smoother and easier.

CHAIRMAN NOTMAN: Is there anything further?

MR. ILLSLEY: I was impressed with the statement that the man who buys the standard device has to pay for the special device ordered by some one else. It seems to me that that could be used as a slogan for standardization—equity for the buyer.

CHAIRMAN NOTMAN: Are there any further questions, gentlemen?

If not, we will proceed to the next paper on the program—"Government Interest in Standardization for Mining Industry." This paper has been prepared by Prof. E. A. Holbrook, Assistant Director of the U. S. Bureau of Mines. In Prof. Holbrook's unavoidable absence, we are going to call on Mr. O. P. Hood, Chief Mechanical Engineer of the Bureau of Mines, to read Dr. Holbrook's paper.

MR. O. P. HOOD: Mr. Holbrook regrets very much that he could not be here at this meeting, but the exigencies of the work of Assistant Director made it impossible for him to come.

GOVERNMENT INTEREST IN STANDARDIZATION FOR MINING INDUSTRY

By PROFESSOR E. A. HOLBROOK, ASSISTANT DIRECTOR, BUREAU OF MINES, WASHINGTON, D. C.

Government interest in standardization for the mining industry, as expressed in major part through the Bureau of Mines,

is the belief that standardization will be a real help to the mining industry, both from economic and safety viewpoints, and since the main purpose of the Bureau is to promote a better mining industry, it becomes plain why the Bureau should in every possible way foster and assist all interests who are working for standardization and better economic and safer practices.

The true meaning of standardization is as little understood as the true meaning of the word "theory," and yet the two have much in common. Theory is a digest of accumulated experience; a safe starting plane on which to base new practice by providing the background of accumulated experience. In the same way standardization, the universal adoption of the best, is practice based on a digest of accumulated experience. A safe and workable basis on which to carry out the best practice.

For the development of better theories research and investigation is needed. Likewise, if standardization is to be truly representative, some body of men must investigate the unusual and little known factors and prepare data on the fundamentals of the subject before a real standard can be built up. This research is not necessarily a laboratory investigation. Your Mining Congress, through its technical subcommittees is as truly doing research and investigational work as is a chemist buried in his laboratory. By bringing out and sorting the accumulated experience of their membership, the committees are laying the only real basis on which standardization can be built.

In many phases of the work you find that past practice has fairly covered the desired field and it is necessary only to use the combined judgment of the members to pick out and recommend from this material, the best. For example, in choosing proper track gauges. In other cases you or any body engaged in standardization will find that there is in existence insufficient knowledge on which to base a standard. For example, you would not today standardize practice in rock drills without stating that the acceptable drill should in operation produce a minimum of dust which might be injurious to the health of the miner. And yet who today could give you any definite data on the character, amount and size of the dust which an acceptable rock drill could or should make? Such an investigation would require considerable money, time and independent supervision. A single manufacturer or a single mining company would not be justified as commercial concerns in making such an investigation as the returns to themselves would not warrant it; your committees themselves are perhaps not closely enough organized or sufficiently equipped to carry out such a detailed work, and yet from a country-wide standpoint the value of the investigation both from health and standardization viewpoints over the course of a few years, would be well on the right side of the ledger.

It is in investigations of this sort that the Government Bureau should take a leading interest, first as a disinterested body capable of serving men, companies and societies that represent the industry; second, as an agency justified in expending considerable sums of money on investigations of such scope that the single private body can not justify itself in doing; third, as a closely knit and continuing body in universal touch with the industry; fourth, as the organization best equipped with necessary workshops and experimental apparatus, and, fifth, as having an organization of trained engineers and investigators whom prime interest and capabilities lean strongly to research and investigating rather than to the commercial and operating side. I know of investigative engineers who have made contributions of real value to the profession who have not been successful as operating men. Likewise, many successful operating engineers have neither the time or inclination to undertake fundamental experimental work.

The function of the Bureau in standardization, then, is to work in fundamentals. Today it is doing this in several ways. First, by suggestion and initiation from its own force of men. These engineers, standing out of close range of the details of the operating end and visiting many plants, are often able to anticipate the desires and needs of the industry in investigation, and the Bureau undertakes the work on its own responsibility. Second, by co-operation with an outside agency. If an outside agency, as a state, or society, or individual, suggests an investigation which the Bureau can undertake it welcomes the work. Often limitation of funds and the immediate value of the work causes the outside agency to furnish part or all of the funds for the investigation. Thus last year there were in effect over forty such agreements, involving expenditures on the part of the co-operating agencies of nearly one-half million of dollars. A very considerable part of this work had a direct bearing on standardization and its accompanying necessary knowledge based on proven facts.

And how best can the Bureau "put across" this work to the industry? By publication and by personal contact with the industry. It is a necessary part of every co-operative agreement that the Bureau shall have the right to publish the results. They are not copyrighted and should be and are free for use in any and every way by the individual, the company or society.

Where the work has been of a nature that the results naturally express themselves as a possible standard, the Bureau has been glad to propose it as such, hoping in this way to easiest, quickest and in the most representative manner, obtain the full criticism of all interests. Where the investigations, in whole or in part, have appeared to fit into and assist in the standardiza-

tion or code work being done by the various state mining departments, the Associated Companies, the Mining Congress and the National Safety Council and others, we have felt satisfied that the work has been worth while. Also the intercourse which our men have directly and personally with the various interests of the industry, as contact in the mines, assistance to manufacturers serving the industry and work with organizations and committees helps to "put across" our efforts.

I believe that standardization is less advanced in the mining industry today than in almost any other branch of engineering with which the American Engineering Standards Committee is functioning, and that in none other is there greater need or a wider field. For example, the other branches have told us that standards in ventilation and in ladders were ripe and ready to pick. Yet what a lot of things we need to learn and sort yet in these branches as applied to the mining industry. In these and in other desirable lines the Bureau hopes to do fundamental and continuous research work. We expect you and the other co-operating bodies to take interest in, to criticize, and if possible to use the work in the interests of better practice and in helping to reduce mining, through standardization to a truly engineering practice.

CHAIRMAN NOTMAN: Is there any discussion of Prof. Holbrook's paper?

MR. DALY: I was particularly interested in the paper just read. A portion of it particularly referred to my home place. I think it was about 1916 that the condition in the mines in the Butte District in Montana, from the standpoint of dust, had gradually grown into a very serious condition.

We didn't realize it, as the gentleman has said; we didn't have time to devote our interest to that as much as to the operation. At about that time we organized a Safety First and Welfare Department to enter into work of that kind.

I would like to say, on behalf of the Anaconda Mining Co. and the other companies operating there, that too much praise cannot be given to the Bureau of Mines for the assistance that they gave us and in which they went ahead independently of us, making investigation as to the causes leading up to silicosis. As you all know, underground mining has a tendency to leave the lungs in the particular condition from dust and other causes that make them more susceptible to tuberculosis, but in addition to the tuberculosis part, the silicosis is the big item in the underground mining today.

The investigation was conducted by Dr. A. J. Lanza and Mr. Harrington. They spent two or three years in the Butte District. We gave them every co-operation that we could because we knew their work was going to bring about good results. As they have proceeded from month to month and year to year they kept us in touch with the determinations that they had been making. It brought us to a point where we knew something had to be done and it was at that time that I demanded from the drill companies that they had to produce a successfully operated water drill.

It was really the demand, I believe, from the operators in the Butte District that first forced the Bureau of Manufacturers to devote considerable time and money and energy toward developing this so-called

water stoper. Prior to that time there had been some water stopers developed but they were not satisfactory.

In conditions where the mines are dry and particularly where silica dust is breathed into the lungs, it is never breathed or coughed out. It is much different from the other particles of dust on account of the angular form and the very sharp corners that it has.

I can say to all the operators that when the people from the Bureau of Mines come to make an investigation of that kind that if they are given the most hearty co-operation, very good results will be obtained.

MR. RICE: That touches very close home to me, because that investigation is one that I have had to do with since it was first taken up by the Bureau of Mines in the Joplin District preceding the investigations at Butte.

The thought I was going to bring up was the difficulty, sometimes, of trying to make standards. We are up against that proposition from trying to make up our minds now as to what should be the criterion in judging the performance of rock drills from the standpoint of health, because while the water drill has made an enormous gain, there comes a cry from South Africa, from their silicosis investigations there, whereby they actually condemn this equipment. I recently saw where one of our best known American drills was condemned because it was not sufficiently satisfactory in laying the finest dust.

However, the problem as it comes to the Bureau at present, it seems to us is not perhaps from the mechanical end, because the standardization of dust production is going to vary manifestly with all the different kinds of rock you have, with the different kinds of steel that you may use—hardness, sharpness and all that sort of thing.

As to the effect on health, our physiologists have not been able to tell us just what is the dangerous amount of dust in the air. The South African Commission, which has had the advantage of being able to closely carry on the health standards and to make autopsies and examinations of men, considered that two dust particles, two microns in diameter finer than that only were a dangerous kind, fine enough to get into the cells of the lungs and ultimately cause the lungs to fill and harden.

However, we in this country are as yet hampered with the fact that we cannot get statistical data based on thorough medical examinations. Unfortunately the state of Arizona, for example, has passed laws which prevent examination in connection with mines. For that reason our investigations there have been hampered so that it is very difficult as yet for us to get the starting point of what constitutes a dangerous dust.

All we can proceed on at the present time is that most all dust containing quartz particles is dangerous dust, but it is a long way, I am afraid, before we can make standards for dust performance with machines. However, it is a long time investigation and we are going to try to keep at it until we get somewhere.

MR. DALY: I may add, too, supplementing my remarks about the water machine, that while that allayed the dust from the drilling, it did not do away with the dust from the other part of the mine; but if it had not been for this investigation that had been made by the Bureau of Mines, I don't believe that we would have brought water through every drift, cross-cut raise and stope in our mines. However, now that we have brought about the water stoper and have introduced it generally, we have to have water connections to those drills, and therefore without any additional expense we spray all of our drifts and cross-cuts, our rock drills and stopes and shoots, and the like of that, wherever the dust demands or requires it.

So the investigation has brought about a condition whereby the number of cases of silicosis will be very materially reduced by that method of operation.

MR. C. S. HURTER: If you wet down the piles of muck immediately after blasting, you reduce the amount of bad fumes arising from them that sometimes affect the matter.

CHAIRMAN NOTMAN: Are there any other remarks?

I don't care to take issue with Mr. Rice, but as an Arizona operator I feel I should come to the rescue of the state in a way. We were threatened with such legislation, but through a fortunate combination of circumstances we avoided it. You might be interested to know that a number of the mining companies in the state, including my own connection at Bisbee, have had physical examination for a number of years past and are still doing it in spite of threats.

MR. RICE: I am very glad to hear it.

CHAIRMAN NOTMAN: Are there any other questions or remarks? If not we will then proceed with the paper on the "U. S. Bureau of Standards and Standardization," and I will again have to call on Colonel Roberts for an explanation as to this paper.

COLONEL ROBERTS: Gentlemen, we had fully expected that Dr. Stratton would either arrive in time from Europe to deliver this address or that Dr. Burgess would recover from his present illness and be able to deliver it. We have been disappointed in both. I will, however, make just a few remarks regarding the work of the Bureau of Standards. I am sufficiently familiar with the work of the Bureau and its co-operation with all other work on standardization to say just a few words.

The Bureau of Standards, under Dr. Stratton's efficient leadership and with his splendid staff and his wonderful facilities, has been of very great help to every organization, industrial or otherwise, that needed detailed, minute and careful investigations on any particular phase of their work. For instance, during the war (and I guess it was carried on before that) we were carrying on a very extensive work on standardization. Dr. Stratton practically turned over his organization during several months to other governmental departments that were carrying on that standardization work.

For instance, we were directing that work through our committees along very similar lines to the work that is being carried on by The American Mining Congress—in other words, The American Mining Congress set up was made from the experience we got in standardization work for the government during the war.

We had many very important investigations to make; as stated by one of our speakers, the data at hand was not sufficient from which to establish standards, and data had to be prepared before we could establish standards. Then we called upon the Bureau of Standards to make those careful, detailed investigations at their laboratories and prepare specifications for us that would then be considered by our committees, the usual procedure having been that we would take the specifications furnished by the various corps and divisions of the War Department and by a process of combination and elimination we would prepare specifications, but very often we had no adequate specification and no one on any of our committees wanted to take the responsibility of trying to prepare such specifications, so there were careful investigations made by a good staff with good laboratories to prepare this information for the committees.

We found Dr. Stratton and his institution at our service at all times in that work and he has assured us since in carrying on this program for standardization for the mining industry that whenever we had problems of that character that our committees wanted assistance on, we could refer them to him and they would very gladly assist us in any way they could.

That, mind you, is along certain lines of laboratory investigations. The Bureau of Mines does the same thing for us in a very much bigger and broader way because they are the direct representatives of the min-

ing industry for the government, and they are closely associated with us in this work of standardization of the mining industry and carrying on at the present time many important investigations on specific lines of work that fit in to our larger program.

That is the way the work of the Bureau of Mines, of The American Mining Congress, and of any other national organization that is trying to do something to improve the method and practices and standardize for the mining industry, is co-ordinated.

I will go into this subject more in detail in an address that I will make on Thursday afternoon on the work of Co-ordination of Standardization for the Mining Industry, but for fear some of you might get away and miss that, I wanted you to know what important factors the Bureau of Standards and the Bureau of Mines are in carrying forward any program of standardization for the mining industry.

Note.—Discussion on Mining and Loading Machines occupied the balance of the morning. Reports of proceedings transferred to page 679. Tuesday morning session.

The meeting then adjourned at 12:15 p. m.

JOINT SESSION OF THE COAL AND METAL MINING BRANCHES

WEDNESDAY, OCTOBER 19, 1921—2:30 P. M.

The joint session of the Metal Mining Branch and the Coal Mining Branch of the Standardization Division convened at 2:30, Col. Warren R. Roberts presiding.

Note.—The first part of this meeting was taken up with a discussion on Mining and Loading Machines, which will be found in Tuesday afternoon's record, page 682.

CHAIRMAN ROBERTS: The only work that we have to do to complete this session is to review the reports which have now been presented to this Joint Conference from the two branches. We have the reports from the Coal Mining Branch and the reports submitted by Mr. McGrath of the Metal Mining Branch. I would like to have Mr. McGrath come up and preside with me to help handle the reports from the Metal Mining Branch.

(Mr. McGrath was not present.)

MR. NOTMAN: I would suggest you appoint Mr. Daly as he presided at most of these meetings.

CHAIRMAN ROBERTS: Mr. Daly, will you come up and assist me in handling the reports from the Metal Branch?

(Mr. Daly then took his seat by the Chairman.)

You will please understand, gentlemen, that now, meeting in joint session, we are going to receive the reports that have been carefully considered by each branch in separate session. We have several excellent reports here from the Coal Mining Branch which were read before that branch, carefully discussed and have since been revised by the committees that submitted them. Now those revised reports are ready for submission to this Conference for disposal, either for their approval or their further criticism.

Mr. Daly has the reports of the Metal Mining Branch and we will first take those under consideration.

MR. DALY: I regret very much to state that the progress made by the Metal Mining Branch has not been sufficient to bring about a final report upon any of the sub-committee matters excepting one. As you know, the Coal Mining Branch began functioning a couple of years ahead of the Metal Mining Branch, and although committees were appointed a year ago covering the different subjects, they have not had sufficient time up to the present to finish any of these matters.

For that reason in all of the sub-committee matters in the Metal Mining Branch, only progress reports have been submitted, and at this time I regret to say that none of the progress reports are far enough advanced in order to even enter into Joint Conference with the Coal Mining Branch. I do not believe, Colonel Roberts, that the progress has been sufficient to even attempt to enter into a joint discussion and I don't know of anything further that the Metal Mining Branch could add at this time.

It is our desire that progress during the coming year will be pushed ahead with much more rapidity, and that at the next Joint Conference some definite action might be had. I was appointed a member of the Committee of Four, two from the Metal Mining Branch and two from the Coal Mining Branch, to discuss the matter of correlating three of the sub-committees. Our committee met and discussed the matter yes-

terday but we had to conclude that nothing could be done at this time.

I don't know of anything further that could be added on behalf of the Metal Mining Branch.

CHAIRMAN ROBERTS: I would like to inquire, Mr. Daly, what the method of procedure would be then with your reports? Would you suggest that your progress reports should be included in our Standardization Bulletin as a matter of information for the industry, with the understanding that immediately following this conference the reports that have been submitted by the various committees, together with a digest of the discussion, carefully briefed following each report, be printed in our "Standardization Bulletin" which we hope to have out in December?

MR. DALY: Yes, a majority of the committee reports are in such shape, and I think it would be advisable to publish them as a matter of information.

If we follow out the method of procedure that was adopted unanimously at our afternoon session yesterday, the industry would be invited to critically study your reports, including the discussions and reply to your Chairman, making further suggestions for the completion of those reports.

MR. DALY: I think that would be ideal.

CHAIRMAN ROBERTS: Then, if that is agreeable to the Conference, that will be the method that will be followed in receiving and publishing those reports together with the discussion. If that meets with the approval of the conference it will be so ordered. Is there any discussion on that subject? If not, we will consider that that is satisfactory to the Conference and the reports of the Metal Mining Branch will be so handled.

MR. DALY: I believe that Mr. Mitke desires to participate in the briefing.

CHAIRMAN ROBERTS: Yes, certainly. These discussions will be mailed to Mr. Mitke, and with the assistance of his Committee, they will be edited by them for the "Bulletin."

MR. DALY: That will be fine.

CHAIRMAN ROBERTS: Then, we are ready to take up the reports of the Coal Mining Branch. Our first report is the Committee on Mine Ventilation. This report was read before the Conference and has since been carefully revised by the Committee and is signed by the Chairman, Mr. Montgomery, and nine members of the Committee. I do not believe it is necessary for us to read this report again as the Committee have simply revised it so far as the suggestions brought out in the discussion seemed advisable to the Committee.

They now offer this report, with those revisions, ready for the approval of the Conference and later to be published in the "Standardization Bulletin" and sent out to the industry.

What shall we do with this report?

COLONEL MILLIKEN: I move that it be accepted, published and sent to the industry.

(The motion was seconded by Mr. Pauly.)

CHAIRMAN ROBERTS: Is there any discussion?

MR. RICE: What does that mean, Mr. Chairman? Does that mean the final expression of the Mining Congress, or is that in a sense something which is put up as a tentative standard for future consideration by the industry?

CHAIRMAN ROBERTS: I would answer your question, Mr. Rice, by quoting the decision reached yesterday as to the method of procedure. These reports were to be printed together with a brief of the discussions that would enable any one who was reading the report to obtain the criticism and suggestions that were offered to that report (and there has been a very full expression in the Conference on the report) and that would enable those who received the "Bulletin" in the

industry to not only read the report and see what the Committee has recommended, but the expression of the conference regarding that report. They are not offered as a standard. They are sent out as the best that we have been able to produce up to date as suggestions for improved methods and practices on standardization. Does that answer your question?

MR. RICE: Yes, except that I can well understand that as it might reach out into the industry, there might be some very valuable suggestions received that possibly might have been overlooked by the smaller committee. Again there may be changes in opinion as time goes on, requiring revision.

I was wondering if it was considered in any sense a permanent standard or whether it would be put up to see if any modifications could be made in it. I do not feel that anything can be made in the way of a standard, except on the dimension, that can be made in any sense permanent.

CHAIRMAN ROBERTS: If you had been present at the reading of these reports, Mr. Rice, you would understand that the recommendations made by our Committees are very largely on approved practices and methods, to gain a greater economy in operation and greater safety, and that thus far we have not gone (in most of our reports) into the details of equipment, although some of the committees have. In submitting this to the industry, if any operator or any operating official is sufficiently impressed with the value of our suggestions, he certainly will adopt them and make use of them; and if he is co-operating with us to the extent we hope he will, and there is anything in our recommendations that he thinks he can improve upon, he will show us the courtesy of replying and making his suggestions. Those will come in to The American Mining Congress at Washington and will be sent to the Chairman of the General Committee who will carefully consider them and send them to the chairmen of the committee of the subject that is under consideration, together with any suggestions that the chairman of the General Committee has to make, after reading the criticism.

Then that Committee will take those suggestions and criticisms under further consideration, preparatory to issuing their report for the coming year. At the same time those committees will be going on into a new field of usefulness in their line pending the receiving of the replies to their previous report, if they have any further work to pursue.

Some of our Committees feel that they have gone as far as they care to until they get an expression from the industry. Other committees may feel that they have further work to do that they can be doing pending the expression from the industry.

Does that answer your question?

MR. RICE: Yes. I regret very much that I was not here when the matter came up for discussion, but I thought, on questions like ventilation, that you might readily touch on possibly some of the standards that might be set by the different states, or even in the case of the Federal government on leased lands—standards such as the limitations in the amount of impurity which might be present in the air.

CHAIRMAN ROBERTS: Is the Chairman of this Committee, Mr. Montgomery, present?

(Mr. Montgomery was present.)

I cannot recall all of your report, Mr. Montgomery, sufficiently to answer Mr. Rice on that question, and I would like very much to answer it through you as to whether your report goes into details of that character that would, in all probability, find any conflicts in the laws of the states or of the Federal government?

MR. MONTGOMERY: I do not think it does, Mr. Chairman. In compiling that report we looked forward to the main principle, that is to the efficient and economical ventilation of mines, and we did not in-

clude any recommendations that we thought would conflict with any of the laws of the different states.

CHAIRMAN ROBERTS: I might answer Mr. Rice, further, by saying on behalf of this Committee that I would consider that this report on Mine Ventilation constituted what I would call the minimum requirements for a properly ventilated mine.

Does that now answer your question, Mr. Rice?

MR. RICE: Yes.

CHAIRMAN ROBERTS: Are there any further questions before we proceed to vote on the motion before the house?

(The motion that the report of the Committee on Mine Ventilation be accepted and published for the industry was put by the Chairman and was carried.)

CHAIRMAN ROBERTS: Our next report is the one on Mine Drainage. All that I have said about the report on Mine Ventilation applies equally to this one on Mine Drainage. The Committee has carefully avoided going into the details of the equipment for proper drainage of a mine, only so far as to lay down the general rules that would apply to equipment to economically drain a mine, and they have subdivided their subject into several different methods of draining a mine to meet various requirements.

I consider it a most excellent report, and I think the adoption of it by this Conference and the recommendation of it to the industry will go a long way toward improving mine drainage. It is really an excellent treatise on the proper drainage of a mine, whether it be a drift, a shaft, or a slope mine.

What shall we do with this report, gentlemen?

MR. PAULY: I move it be accepted.

(The motion was seconded.)

CHAIRMAN ROBERTS: This report is signed by the Chairman and three members of the Committee who are now present.

Is there any discussion of this report?

(There being no further discussion, the motion was then put by the Chairman, and carried.)

The next report is one by the Committee on Underground Transportation. Mr. Watts, the Chairman of this Committee, is not present, but he is well represented by the members of his Committee and three sub-committees. This report, as I advised you at our previous session consists of a very brief general report presenting the reports of the three sub-committees—one on Mine Locomotives; one on Coal Mine Cars; one on Mine Tracks and Signals. These are all very fine reports, very complete in many details, and while I could not pass upon these reports personally as well as I could on the two previous ones, as many of the subjects were unfamiliar to me, it appeared to me to be a very excellent report. This report by the Sub-Committee on Mine Tracks and Signals is accompanied by a detailed diagram of frogs, turnouts and switches and is a most complete and valuable report.

I think any mine superintendent or competent mining engineer could take this report and properly lay out his tracks for any of the track gauges or other requirements that have been covered by the report.

The report by the Sub-Committee on Mine Locomotives is briefer, as this sub-committee has not gotten into the subject so far; but my recommendation would be that the reports be accepted and printed with a request that these sub-committees continue the good work that they are doing.

What is your pleasure in the matter?

MR. KUDLICH: I move that the reports be accepted.

(The motion was seconded by Mr. Pauly.)

CHAIRMAN ROBERTS: It has been moved and seconded that the report of the Committee on Underground Transportation, together

with the reports of the three sub-committees be received and disposed of as ordered by the previous motion.

(The motion was carried.)

I neglected to say that these reports are all properly signed not only by the Chairman of the General Committee, but the chairmen of the sub-committees.

The next report is on Outside Coal Handling Equipment. It is signed by Dr. Payne, Chairman. Mr. Needham, I handed you the original copy of this report and since you were not present when it was read, but have been very active on the work of this Committee I would like to know if you have any suggestions or additions to make to this report before we accept it?

MR. NEEDHAM: I think not.

CHAIRMAN ROBERTS: This report, of course, will be published if so ordered, together with the transcript of the discussion at the Conference. What shall we do with this report?

COLONEL MILLIKEN: I move that it be accepted.

(The motion was seconded, was duly put by the Chairman and was carried.)

CHAIRMAN ROBERTS: That makes five valuable reports from seven of our committees.

We have two more committees, one on Underground Power Transmission, of which Mr. Kiser is Chairman; and one on Power Equipment, of which Mr. Pauly is Chairman. Mr. Pauly advised you yesterday quite fully as to why they had not offered any further report. The fact is that the two committees, acting jointly, had rendered so complete a report last year that they did not consider they had anything further to do at the present time until they had received the replies from the industry to which the report had been very fully distributed.

We are now ready to receive the report from the Special Joint Committeed appointed on Monday to consider certain suggestions made by your chairman at that session. Colonel Milliken, I believe you have your report ready for the Conference.

COLONEL MILLIKEN: Yes, our report is ready.

REPORT OF SPECIAL JOINT COMMITTEE OF THE TWO BRANCHES

The joint committee consisting of two members from each, the Metal and Coal Branches, of the Standardization Conference—appointed to consider the advisability or practicability of combining the committees of these branches where the subjects seem to be identical—and to review the reports that have been presented and discussed, have given careful consideration to these subjects. They are unanimous in the opinion, first, that the time is not yet ripe to attempt the consolidation of any of the Committees. It is thought that each Branch is making progress in its own way, that because of the wide divergence in operating condition in the Branches, the fact that the two Branches operate largely in separate districts of this large country and because at the present time the majority of reports are ones of progress—better results will be obtained by continuing the present organization.

The Committee feels that at a later date there may be some consolidations that will be of value. They appreciate that in the near future recommendations may be made by one Branch

that can consistently be adopted by the other. They appreciate, too, that in the near future the two Branches may make recommendations for like operations that may be conflicting.

They, therefore, recommend the appointment of a Standing Joint Committee whose duty it shall be to review the reports of the several Committees before being finally presented to the Congress in order that conflicting recommendations may be avoided.

If this recommendation meets with the approval of the Joint session of the Standardization Conference, they further recommend that Committees forward their reports to their respective Chairman—three months in advance of the date of the Annual Meeting in order that the Joint Committee may have sufficient time to digest and to make their definite recommendations.

This Committee feel that when reports have been discussed on the floor of the Convention, that the Chairman of the several committees are in better position to make final recommendations than for this Committee or a Standing Committee to attempt.

Respectfully submitted,

J. MILLIKEN,
E. D. KNIGHT
W. B. DALY
ARTHUR NOTMAN

CHAIRMAN ROBERTS: The members of the Metal Mining Branch have agreed to this report?

COLONEL MILLIKEN: Yes, they have all signed it.

CHAIRMAN ROBERTS: Mr. Milliken, your committee has done splendidly. Gentlemen, you have heard the report. What shall we do with it?

MR. HOOD: I move that it be accepted.

(The motion was seconded.)

CHAIRMAN ROBERTS: You have heard the motion. Is there any further discussion of the matter?

(The motion to accept the report of the Special Joint Committee was put by the Chairman and was carried.)

CHAIRMAN ROBERTS: That disposes of this question so far as this particular phase of it is concerned.

Now we should take up the recommendations of the Committee that a permanent Joint Committee should be appointed to carry on along the lines suggested for this Temporary Committee. I think it is an excellent suggestion to have a permanent Joint Committee to coordinate our work.

After a considerable discussion of the subject it was decided by the Conference to adopt the recommendation of the temporary Special Joint Committee that a permanent Joint Committee be appointed to carry on this work of co-ordinating the reports from the two branches of the Standardization Division.

It was also decided that having adopted the report, including the recommendation of the temporary Committee, that the Chair-

man had authority to appoint a permanent Committee. Whereupon he appointed on behalf of the Coal Mining Branch, Messrs. Col. J. Milliken, E. D. Knight and K. A. Pauly.

The representatives of the Metal Mining Branch, after a Conference, appointed Messrs. W. B. Daly, Arthur Notman and Chas. A. Mitke.

CHAIRMAN ROBERTS: I wish to bring to your attention again the method of procedure which was mentioned in my report at the first session of our Conference. After our reports have been fully approved by the Standardization Division and we have these completed reports ready to offer to the industry, what shall be our method of procedure?

(The Chairman then outlined again briefly the method of procedure for the adoption of our reports, as follows: when we have completed any particular work, like the final adopted report of one of our Committees and consider that this is ready for the industry and want to make it a standard, then we submit this report to the General Correlating Committee with sufficient copies of it to enable them to send a copy to each member of their Committee. Such bodies as are not interested in the subject so advise and any member body that is interested in the subject can then require the appointment of a sectional Committee on which Committee there shall be representation from all member bodies who are interested in the subject. At the same time each representative on the General Correlating Committee must advise whether his society is interested in the whole or a part of the work under consideration. If interested in all of the work then his society becomes a joint sponsor on the Joint Sectional Committee and if interested in only part of the work his society becomes only an associate in the preparation of the completed report for an American Standard.

When this Sectional Committee has completed its work on this subject then it reports back to the General Correlating Committee. If any changes have been made by this Sectional Committee in the report as submitted by the member body originating the report, then the report must be sent back to that body for final consideration and approval of the changes made in the revised report. In this manner it is then finally sent up to the General Correlating Committee as a recommended standard and this Committee in turn so recommends it to the American Engineering Standards Committee.)

After a very considerable discussion of the subject the Conference decided to adopt this method of procedure. A motion was made by Mr. Pauly, duly seconded and unanimously carried by the Conference that this method of procedure should be adopted and that a joint Publicity Committee should be appointed of two representatives from each Branch of the Standardization Division to assist in carrying out this method of procedure and otherwise promoting publicity of the work of the Standardization Division.

At a later Conference with the members of the Coal Mining Branch, the Chairman appointed as representatives of this Branch, Messrs. Ralph C. Becker, C. H. Trik and the representatives of the Metal Mining Branch appointed Messrs. Chas. F. Willis and T. O. McGrath as representatives of this Branch.

That completes the program for the afternoon. If there are any suggestions, however, from the Conference, I should like very much to have them.

MR. KUDLICH: On behalf of the Resolutions Committee I have a resolution to present. It is offered by Mr. Milliken.

(Mr. Kudlich read the resolution.)

CHAIRMAN ROBERTS: I would like to inquire from the author of this resolution if it was intended that this resolution should be a request for such a procedure at our next conference, it being too late now to carry such a resolution into effect?

COLONEL MILLIKEN: For succeeding conferences.

CHAIRMAN ROBERTS: Your recommendation is that this method of information for the members and guests of the Standardized Conference should be carried out at the next conference?

COLONEL MILLIKEN: Yes, sir.

MR. BELL: Mr. Chairman, I am a member of the American Chemical Society and at our convention recently in New York City, we published every day about noon a list of the members that had registered, their occupations and home addresses and also where they were stopping in New York City. There was more eagerness shown in getting copies of this Registration List than anything at the convention.

COLONEL MILLIKEN: I might say a word in explanation. I too belong to several organizations that have meetings where they publish such a bulletin. My first thought in coming to a convention is that I want to know who is here, whether some of my friends are here, whether members of committees are here. With such a bulletin you can very readily find whether or not they are here and locate them.

It is very cumbersome to get this information from the Registration Office. I think it is something that would be very much appreciated if put into effect.

MR. MONTGOMERY: I move you that we adopt this resolution.

(The motion was seconded.)

(The motion to adopt the resolution was then put by the Chairman and was carried.)

CHAIRMAN ROBERTS: Mr. Kudlich will offer this resolution to the Chairman of the Resolutions Committee of the Convention.

That reminds me, gentlemen, that I have not appointed a Publicity Committee. I have been so taken up with other duties that I forgot that you authorized me to appoint a Publicity Committee and I have given no thought to it. I will have to confer with representatives of the Metal Mining Branch before we appoint that Committee. Therefore I am sorry that I can not announce that Committee, but I will announce it at a later session.

We have only completed now the routine work in connection with our reports. We have not completed the work of our Conference. I will just remind you of the important matters and sessions that are still on our program.

(The Chairman made announcements concerning the program.)

COLONEL MILLIKEN: Before we adjourn I would like to say a word about our Chairman. I wonder if very many of us realize the tremendous amount of work that the Chairman of a convention of this kind is called upon to do. Our Chairman has not only seen to the appointment of all committees, but he has followed up the work of the individual committees. He has received their reports, he has handled

all of the work in connection with the Standardization Conferences here in Chicago, and I think not only for the Coal Section but very largely for the Mining Section, in the absence of Mr. Mitke.

It has all been done wonderfully well and I would like to suggest that we stand up and give a rising vote of thanks for the very efficient and courteous way in which our Chairman has performed his duties.

(The members arose and applauded, indicating unanimous approval of the suggestion made by Mr. Milliken.)

CHAIRMAN ROBERTS: I thank you very kindly. It has been a pleasure as well as an honor to serve you, and I only have one request to make, and that is that you shall urge upon The American Mining Congress that they engage somebody to do part of this work for me. I am willing to direct it but I cannot do the amount of work that I have had to do the last six months, and we are going to make a request upon the management of The American Mining Congress that they shall secure someone who shall be the direct and active head of the Standardization Division which is the largest division in The American Mining Congress.

I thank you very much, gentlemen.

The meeting then adjourned at 4:25 P. M.

ADJOURNMENT.

JOINT SESSION OF THE COAL AND METAL MINING BRANCHES

THURSDAY, OCTOBER 20, 1921—2:45 P. M.

The Joint Session of the Metal Mining Branch and Coal Mining Branch of the Standardization Division convened at 2:45 P. M., Col. Warren R. Roberts presiding.

CHAIRMAN ROBERTS: According to the program of the Standardization Conference we were to have held this session at 2:30 this afternoon in this room. I think if there is anything that is discouraging and almost disgusting it is to work for weeks to prepare a fine program, invite men of national reputation, busy men, to spare their time to come to this city and deliver addresses, and then the members of the convention have many other things to do at the time those addresses are to be delivered.

We started in at one of our sessions yesterday with only about this many people and before our program was through we had 100 or so who strolled in. I have done the best I could to try to get an audience for our speakers. I am offering this as my alibi. There are so many attractions in this city that the men who come in from outside of the city are everywhere except attending this session to hear these addresses, and I apologize to the speakers who have gone to the trouble and expense and have sacrificed their time to come and deliver addresses and find that we have no audience for them.

Our first address this afternoon is on Safety and Standards. That is just a brief statement of the purport of the address. Mr. S. J. Williams, the Chief Engineer of the National Safety Council, will advise you as to the exact nature of his address and we have very great honor in introducing Mr. Williams to speak on Safety and Standards. Mr. Williams. (Applause.)

SAFETY AND STANDARDS

By

MR. S. J. WILLIAMS, CHIEF ENGINEER, NATIONAL SAFETY COUNCIL, CHICAGO, ILL.

Mr. Chairman, I think that was a pretty neat alibi to give to a Chicagoan, to say that the glories of this city, to which I, as a resident must of course assent, are such as to attract the multitudes away from the otherwise facinating eloquence that they have an opportunity to listen to here this afternoon.

Alibis, however, are not necessary, Mr. Chairman, because I know the high quality of the standardization work of The American Mining Congress that you gentlemen are engaged in; and it is quality that we want more than quantity.

You have heard yesterday of the importance of standardization work in the mining industry from various points of view and I don't think I have to touch on that side of it or duplicate any of the persuasive arguments and reasons that were undoubtedly set forth as to why this work should go on.

Obviously any sort of standardization is of interest and value in accident prevention, because when you bring about some measure of uniformity in equipment or operating methods, whether directly concerned with safety or not, you correspondingly decrease the opportunity for misunderstanding and ignorance of those methods on the part of new men, which we know is such a frequent cause of accidents in the case of men changing from one place of employment to another.

With respect to standards that directly affect accidents prevention—in other words, uniformity in regulations which are themselves for the purpose of safety—it is equally obvious that where we have a lot of conflicting jurisdictions, or a lot of conflicting standards on the part of adjoining states, that we have a corresponding lot of grief and trouble and often expense for the companies that are operating under those different jurisdictions.

So what few observations I have to offer here this afternoon are going to be concerned more with how we get the job done. I think we all who are here agree that it has got to be done, and if I have anything at all to contribute, it will be along the line of how it can be done successfully.

It occurs to me that the job of standardization is a two-fold job—one part engineering, the other part diplomatic work. Speaking as an engineer, with at least my fair share of pride in the profession, I say honestly that the diplomatic part of the job is a good deal bigger than the engineering part, because no matter how good a standard we may formulate, it is not worth the paper it is written on unless it is going to be used, and if half a dozen or a dozen of the finest engineers in the country get together in a room and formulate a standard that is absolutely perfect, a dozen other men, whether operators or politicians or even the rank and file mine prospectors off in some state, can absolutely nullify the work done by the engineers because they can prevent the standards from being practically put into effect.

There is no use in building a great edifice of engineering skill unless we have first the broad foundation, and that foundation I thoroughly believe must be a foundation of democratic consent and approval of the job. You, Mr. Chairman, thoroughly recognize that fact. I have often heard you refer to the necessity of selling this whole proposition to the industry, to the mining industry in this case and The American Mining Congress has recognized the necessity of proceeding in that way.

Not only must it be so to the industry but it must be so outside the industry. It must be so to governmental authorities. It must be so to insurance authorities. It must be so to the rank and file of people that have an influence in one way or another on legislation that is to be enacted in the various states in which these standards are to be crystallized.

A few years ago we used to say, "Well, democracy is a good thing in a way but if you really want to get anything done, the autocratic way is the one" and we used to point for proof to the achievements of nations that we looked upon as autocratic. We don't hear so much of that the last couple of years. Germany was efficient in the first few months of the war but the German efficiency of autocracy broke down in the last years of the war because it was not founded on popular consent and you will pardon me for reiterating it, but I feel so very strongly that that is the basis that we must have for this sort of work.

So, as I was saying, The American Mining Congress has recognized the breadth that we must have by not only making standardization as democratic as possible within the ranks of The American Mining Congress, but by voluntarily tying it up through the medium of the American Engineering Standards Committee with similar organizations everywhere in all lines of industry that are working toward the same end.

I go further than that. The democracy of standardization must be the very extreme of democracy. It must be a round table democracy, where there is hardly any perceptible leadership. For example, let me refer to the movement that is now pretty well under way for the standardization in safety codes generally, in all industries. Two or three years ago it became evident that there was a widespread demand for uniformity in safety legislation, both governmental and insurance, and yet as people got together and talked about it, it became evident that there was a very widespread objection to permitting that very necessary movement to be headed up in any one place by any one organization, whether a governmental department or a semi-private association, and the National Safety Council, although having possibly the broadest general interest of any one organization, made no effort to take leadership in the movement but rather said, "We will be glad to come in as one of you and form a round table group in which every one of us comes in on an equal basis."

There is all the difference in the world, gentlemen, between saying, "My organization has a Committee and we would like very much to have you come in and advise that Committee and we will take it and give careful consideration to your suggestions," and saying, "Gentlemen, let's form a Joint Committee and let's all get together and work this thing out."

I have seen examples of that in standardization efforts in other fields besides mining, where people, coming together with the best intentions in the world, trying to have their own particular organization head up some movement, and inviting others to come in and advise and then to go home again and let the Executive Committee of the first organization determine where they have absolutely failed in that effort, because the men

called in, whether they were big or little in the eyes of the world, were in their own eyes just as big as the people that called them, and they didn't propose to come in and be heard and then go out and have somebody else decide.

We can't do it that way. I don't know of another example as good, at least none better in practical affairs, than the essential soundness of the injunction, "He that would be first among you, let him be the servant of all." Leadership in this standardization work, gentlemen, whether leadership of organizations or of individual men is going to come to the organization or to the man who makes the least pretention to leadership.

I have just one other observation to make, with respect now more to the content, to the form of the standard itself. I don't suppose anybody ever started a job of standardization of any sort without running up against the question of whether the standards should be general or specific. I have seen that fought over at least for the last eight or ten years in which I have been interested in the subject in one capacity or another, and it is one of those questions that is never going to be settled.

Everybody starts out to make a standard with the firm determination that he is going to confine himself to broad general principles and everybody equally, when they get on to the job, find themselves immediately involved in a mass of detail. There is no happy solution to that, but I think there are one or two principles that may be observed.

One is by all means to make the standard, wherever possible a standard of performance rather than a specification of method. One can't always do that and the practical answer is that where a specification of method or a specification of the exact equipment to be used is necessary, always to couple it with the statement that another method or other equipment, giving equal safety or equal results, whatever the desired results may be in the judgment of the authorities, shall be equally acceptable.

Anything else makes you wide open to the immediate criticism that you are stifling development of the art which, of course, if that criticism is justified, is absolutely deadly to the progress and the popular acceptance of the results of your standardization.

I believe that every standard which is either intended to be enacted into law or which if not so intended may be taken by some ultra-progressive or ultra-zealous legislative body and enacted into law, should begin with a carefully framed paragraph which will permit the substitution of equivalent methods or devices which, after proper examination and proper safeguards by the authorities having jurisdiction, may be found to give equal results to that specified.

It is obvious that that throws you at once into the question

of whether you can trust your inspecting and enforcing authorities. That, gentlemen, is a question you can't get away from. If your enforcing authorities are incompetent or dishonest, your standard is no good anyway whether it is general or specific.

I believe—and I speak on this point as having been for five years in charge of a governmental administrative department that was up against these things—that you will get further if you practically give your administrative authorities power, not to let down the bars, but to accept the equivalent methods or equipment; that then you increase the possibility of having a wise and fair administration of your laws.

You can't give a man responsibility without authority and if you give him both authority and responsibility, then you can hold him for results, and if the people of your state, or whatever the jurisdiction may be, know that that is the sort of responsibility that your administrative authorities have, why there is that much more chance that the people of your state will demand good authorities.

Then finally, if as a corollary to this, it is necessary to leave your standards elastic to permit development of the art, to permit the use of equivalent methods or devices to where they will be economical, why then, that, of course, obviously implies that you have got to have some continuing central body, committee or whatever you may call it to guide the development of your standards along those lines of elasticity.

Take, for example, the Boiler Code that you are all familiar with: my impression is that the Boiler Code Committee thought, when the code was done, that the committee was going to disband. On the contrary, I think the committee's work is now almost greater in volume than it was in the beginning, because with the constant interpretations of the boiler code on the part of inspectors of all shades of authority, both in governmental and insurance fields, making interpretations and referring back to the committee, or asking the committee to make interpretations for them or other people complaining to the committee that wrong interpretations have been made.

Therefore your standardization body must be a living, continuing thing, and that is all the more reason why it should be organized on a sufficiently democratic basis so that it will command general respect.

That, gentlemen, in my humble opinion, is the general path along which this work must go, if it is going to be successful. If it does go along that path, with absolute forgetfulness of selfish interests on the part of either individuals or organizations, with a single desire for service, I believe that it is going to be one of the biggest movements of the kind that American industry has seen and that if the men in the organizations take

part in it unselfishly, they are going to be recognized in later years as having made a very big contribution. (Applause.)

CHAIRMAN ROBERTS: We are going to have time this afternoon for discussion of each paper as read, and if at this time you have any questions to ask Mr. Williams, or any suggestions to make regarding his address, or any questions that arise in your mind from having heard his address, we would now be glad to hear from you. We would like very frank and free discussion of each one of these papers. That is one of the benefits that come from having an address read in the Conference.

Have you any questions to ask, Dr. Agnew?

DR. AGNEW: No.

CHAIRMAN ROBERTS: There was one thing that occurred to me while I was listening to Mr. Williams, that I think would be of interest to the Standardization Division. We had been hoping that we would develop this work for The American Mining Congress to a state where they would be justified in having such a man as Mr. Williams in connection with the work of the National Safety Council. This is an old organization that has been doing splendid work in a national way in promoting and directing the work of safety in all of the industries in the United States.

Our work, of course, is applied to a single industry. Their work covers all industries, but they have sufficiently developed that work that they can afford to have a man like Mr. Williams, who is their Chief Engineer and Secretary, and I am living in the hope that the time is not far away when The American Mining Congress can have a man devote to this work, as the work is of sufficient importance to have some able man give his entire time to directing this work and helping to promote it in the industry.

I neglected to announce, before calling on the first speaker, the general subject, but it is in your program and you have all no doubt noticed it. The general subject for discussion this afternoon is the "Commercial View of Standardization," as against a very different subject that we discussed yesterday forenoon. In other words, these addresses and speeches were carefully selected to cover that general subject of the commercial view of standardization. It is a session jointly by the two branches of the Standardization Division, and Mr. McGrath, sitting beside me, is the representative of Mr. Mitke, the head of the Metal Mining Branch.

Now we will have our second address on "Standardizing Research Results Through Public Information," by Mr. C. R. Thomas, Editor of the Professional Engineer. Mr. Thomas. (Applause.)

MR. C. R. THOMAS: Mr. Chairman and Members of the Conference: When the Chairman apologized for the size of the audience, it occurred to me that John Wesley was converted in a meeting much smaller than this, and if we can have one more John Wesley for the standardization movement out of this meeting I think it will be a wonderful success—we already have one John Wesley in Colonel Roberts. (Applause.)

When your Chairman asked me to speak on the subject of Public Information and the Relation between Research and Standardization, he didn't know that he was asking me to talk about my hobby. I am a courtier in the court of His Majesty the Public; and if you do not believe that the public is "His Majesty" just take a whirl at it.

STANDARDIZING RESEARCH RESULTS THROUGH PUBLIC INFORMATION

By C. R. THOMAS*

Research and standardization are apparently at opposite poles; the one seeks to discover the new, the other seeks to stay put. And yet there must be some common ground. For standardization without research leads to stagnation and research alone would lead to greatly reduced production of many products which are universally needed at a low cost. I believe that no common ground for research and standardization can be obtained except through a mutual and intimate knowledge of aims and accomplishments. This knowledge must be thorough and instant. In the machinery of modern business the press, and particularly the scientific press, is a most useful medium of education and the exchange of ideas. For while the press may tend to retard standardization by continually noting new developments, it also prevents mistakes that might prove disastrous in a new business.

The press is limited for constructive work by the lack of balance which exists between research and standardization information. There is a natural tendency on the part of men engaged in research work to be reticent in giving out ideas and accomplishments connected with their work. On the other hand, the principles of standardization are widely recognized as desirable for adoption and have been discussed in the press. The standardization problem is largely one of getting men to agree upon a method of procedure, and following this method of procedure to a logical and universal conclusion. And so lack of balance is, I believe, the greatest obstacle in the way of standardization at the present time.

The development of a proper balance between research information and the standardization of methods, materials, or machines is so interwoven with the vari-colored cloth of business that it would be a hardy man indeed to attempt to say just when research results should be standardized in production methods. Using a glittering and almost useless generality, it might be said: The quicker the better, if one is sure of his ground; but it is easy to make mistakes.

Research may be arbitrarily divided into scientific or altruistic research, conducted largely by educational institutions which seek solely to add to our store of knowledge, and industrial research, generally the result of private enterprise, which seeks to improve products so that the owners may benefit. So-called statistical or business research may seek to add to the store of

---

*Editor, "Professional Engineer," and in charge of Public Information, American Association of Engineers. Formerly in charge Review and Publication of Results, U. S. Forest Products Laboratory.

knowledge or it may be for private gain. Dr. C. E. K. Mees, the head of the Eastman Research Laboratory, says that the results from research are so indeterminate in the beginning that a distinction can be only as to intent. Of the three types of research I believe that business or statistical research is perhaps the greatest aid to standardization. For by determining and tabulating just how many and where existing methods and ideas have a common ground, standardization is furthered.

The General Electric Company, which has been developed largely through the stabilizing of research results, illustrates how private research may be organized. This organization may be roughly divided into a research unit, a development unit, and a production unit. In the development unit research ideas are tried out and methods determined which are later put into effect commercially in the production unit. In this way costly mistakes are avoided and full advantage is taken of the development of new ideas.

Research results obtained by private enterprise are not available to the press to the extent that results obtained by government research organizations or universities are made public. The reason for this is obvious and needs no discussion. A workman is entitled to the reward from his work, and for this reason we have patent laws—even though sometimes patent laws are inadequate and the workman does not get his due reward. On the other hand, research methods have developed in the past decade so that many manufacturers find little protection in the secrecy of their ideas and they must depend largely on the effectiveness of their productive and distributive organization to make their business profitable. If this is true, much greater publicity can be given to research results by private individuals; and they would profit more thereby. On the further development of the idea hangs to the greater usefulness of the press as an aid to standardization.

It is an interesting fact that the centers of many great industries are at the place where advanced methods were first used in that industry. The rubber industry is centered in Ohio, the automobile industry in Detroit, the optical glass industry in Jena, and there are many other examples. The reason seems to be that there were men with the tested information that would permit standardization for quantity production, and hence profitable manufacturing. This industrial concentration would probably have not existed to any such extent had the press been utilized as fully as might have been profitable to the industry as a whole and most certainly to the people, who use the manufactured products of that industry.

Admitting the advisability of utilizing the press to present the results of research work in an informational way for the immediate use of those who are seeking to standardize for quantity production and therefore economy, let us consider how the press

has been utilized by some organizations in this country. The Government departments are a great medium of research and standardization. There we find research work in progress, statistical research to the nth power, and the fullest publicity through the press given to all results—although I have known two years to elapse between the time a manuscript was sent to the Government Printing Office and the date of its appearance in print.

Consider the Bureau of Standards, which is in reality an immense research organization. If fullest publicity is not given to results obtained there we have a paradox—a union of two extremes. But the paradox is avoided by means of publicity. Dr. Stratton, the able director of this organization, understands well the delicate relations that exist between standardization and research, and the value of public information in maintaining a proper balance between the two. Standardization results that he has been able to achieve have been largely due to the speed with which research information has been made public. Mr. C. P. Winslow, director of the Forest Products Laboratory, where I formerly worked on the review and publication of results, believes firmly in the value of public information as an aid in standardization of research results, to the end that production costs may be reduced and thereby greater general prosperity brought about. I believe that publicity was the basic idea that made possible the great work of Dr. Holmes in developing the Bureau of Mines and effecting economies in the mining industry through standardization. The Bureau of Mines is another immense research organization and Dr. Bain has followed a comprehensive plan of public information. The rapid standardization of the use of concrete by the Portland Cement Association is a most excellent example of what can be accomplished by a private business through public information. In this case, private enterprise deliberately established a publicity organization which is also, by the way, a very effective research organization to popularize—another word for standardize—the use of a material. I believe you will admit that it has been a most successful venture both from a business standpoint and from the standpoint of making everyone familiar with a useful material.

The mining industries have to do with the production of raw materials and it is an economic fact that raw materials are affected first by a decline in public demand for manufactured products. Standardization of demand is of much greater importance to the mining industry than the standardization of the methods of mining. In the standardization of demand a policy of public information can be followed to a much greater extent than it has been used in the past.

I believe that engineers as a whole have not realized the importance of public information. One of the objects of the American Association of Engineers, with which I am connected, is to

popularize public relations among engineers. Manufacturers, on the other hand, appreciate the friendship of the public.

But you may ask "How shall I as an engineer, or a producer, or a manufacturer, utilize the press in aiding standardization? Scientific and trade organizations," you may say, "publish the results of their work and we have a technical press already too voluminous to be read."

The machinery for public information undoubtedly exists, but is it working to capacity, and has standardization been effected in the methods of getting information to the press, and do these standardized methods function properly? From my experience as a technical editor I am inclined to think that they do not function properly. It is exceedingly difficult to get a scientific man to present an idea to the public through the press until it has been so thoroughly developed that he is absolutely sure of it. This procedure is perhaps correct from the standpoint of the scientists but from the standpoint of the interested manufacturer or man who must standardize upon the results that are obtained and who may be planning to standardize on methods which have been in vogue for some time but which new development may make obsolete, knowledge of possibilities is frequently as valuable as knowledge of actual accomplishments. Moreover, the great consuming public may not take kindly to the new idea. Public opinion is exceedingly wilful and frequently it does not respond to new ideas as quickly as scientists and manufacturers estimate. It takes a long time to popularize a new idea and it is well to be forehanded and start early. Standardization is based upon popularity and follows well in the rear of new development. While it requires courage and vision for a manufacturer to standardize his equipment for the production of a new product, if he guesses right he receives a great reward.

I believe that industries should organize bureaus for public information about research and standardization. The chemical industry has realized the importance of this work; the effective work of the American Chemical Society is well known to most of you. Editors are only too anxious to receive information as to new developments in an industry and improvements in old methods which lead to standardization. Technical editors as a class are men of judgment and honor and they would not knowingly publish anything that would react to the discredit of any engineer with constructive ideas, or any organization that is seeking to advance the industry and to better economic conditions in the country. You can trust the editors of the technical press to a much greater extent than they have been trusted in the past.

A technical editor told me recently that he obtained an authoritative account of a failure of a large structure, and when this account was submitted to the owners of the structure they demurred at having it published. It was only after the editor had

sent a hundred-word telegram (which he said was more effective than he expected) in which he recounted the dangers of having the account of the failure garbled by reporters who were not fully acquainted with the facts, that permission was obtained to publish the details. The reticence on the part of the owners was perhaps pardonable and it is to their credit that they had the vision to see that the country as a whole would benefit by not maintaining secrecy in the affair.

Again we have the familiar case of the inventor who has a wonderful idea and who will not impart it to even a patent attorney. His idea is of no benefit to himself or anyone else. Again we have the trade organization with its secrecy and fear of competition—a falacious idea which proves profitable in very few instances. For competition is the life of business. The more people in a business the more business there is. Newspapers which are our daily record of affairs can be used effectively to standardize ideas and methods. The people as a whole are always interested in new developments which affect their pocketbook and health.

The detailed discussion of the methods employed in public information work is beyond the scope of this paper. But the numerous avenues of public information available through organized effort are indicated in Table 1.

A typical functional organization for a public information bureau using all methods of publicity is shown in Figure 2. A similar organization for institutions of a public or charitable nature in which people are so interested that it is seldom necessary to buy advertising space to obtain publicity is shown in Figure 3. Figure 1 shows the varied appeals possible.

Summing up, it is believed the mining industry can profit by the use of the press in popularizing research and standardization information. Standardization makes for lower production cost, and with low cost comes greater use, for it is a law of economics that when costs increase substitutes are used. Moreover, with intimate knowledge on the part of the public will come the hearty support of the public. Public support is a valuable asset and an economic force that cannot be neglected with impunity.

TABLE 1. PUBLIC INFORMATION MEDIUMS

(Omitting Magazine and Direct-by-Mail Advertising)

NEWSPAPERS AND MAGAZINES

1. News items relating to specific happenings or accomplishments.
2. Photographs with short descriptive captions.
3. Editorials.
4. Cartoons of any kind.
5. Interviews with prominent people.
6. Sunday feature articles.
7. Special column comment: (a) humorous, (b) sporting, (c) women's, (d) society.

8. Letters to the editor and answers.
9. Feature stories for magazines.
10. Technical articles for trade magazines.
11. House organ articles and comment.
12. News syndicate photographs.
13. Picture syndicate photographs.
14. Contests: Limericks, jingles, definitions, letters, songs, photographs, posters, essays, slogans.
15. Slogan campaigns such as "Concrete for Permanence."

The Spoken Word

1. Addresses by prominent men which are reported.
2. Proclamations by prominent men afterwards printed.
3. Short talks at meetings of various kinds at the theatre, in public schools, and at luncheons or dinners.
4. Announcements at public gatherings such as society meetings, auctions, athletic events.
5. Pulpit notices and sermons.
6. Committee membership in scientific and economic organizations.
7. Solicitations of salesmen and organizers.

Demonstrations

1. Mass meetings of people interested.
2. Receptions to special groups.
3. Group demonstrations by local sections, lodges, clubs, military organizations, etc.
4. Elaborate exhibits at conventions.
5. Parades on city streets and at fairs.
6. Stunts such as sandwich men, band wagons, etc.
7. House to house solicitations with samples.
8. Time allotments such as "Fire Prevention Week."

Visual Reminders

1. Posters and cards as: (a) billboards, (b) windows, (c) bulletin boards, (d) automobiles and trucks, (e) hotels, (f) railroad stations, (g) street cars.
2. Banners and streamers on streets.
3. Electric signs.
4. Tags, stickers and rubber stamps for use on letters, packages, pay envelopes, etc.
5. Handbills.
6. Inserts for use in packages of all kinds, books from libraries, mail, newspapers, and pay envelopes.
7. Displays in merchants stores, windows, and on sidewalks.
8. Exhibits in public schools, and posters and other work by school children.
9. Advertisements on theatre programs and score cards.
10. Slides and short news films for use in motion picture theatres.
11. General interest motion pictures for use in schools and theatres.
12. Technical motion pictures for conventions and selling.
13. Stereopticons and automatic lanterns in lobbies, store windows, public buildings and at night on vacant walls.
14. Cards of invitation, advance announcements, and programs.

The test of Public Information is "Do People Talk About It."

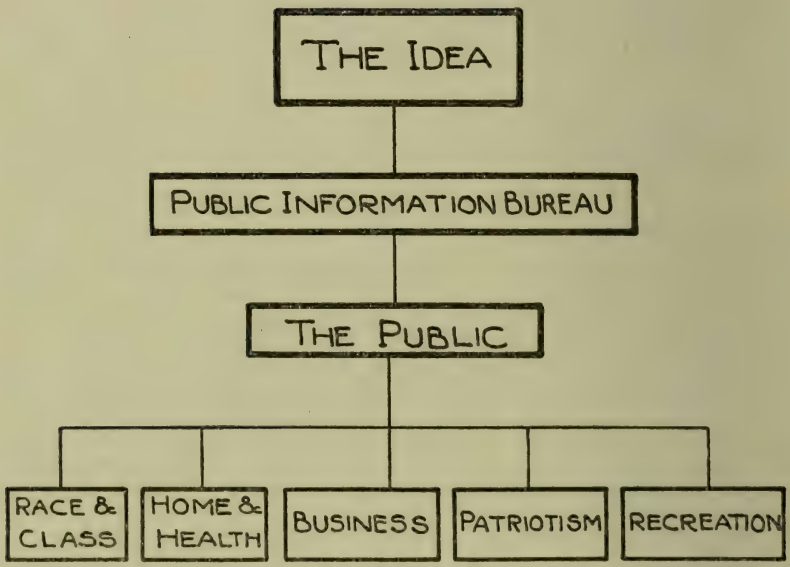


FIGURE 1

Varied Types of Appeal are Possible

Note.—This chart shows how the appeal of an idea may be directed to the part of the public which is most interested in each particular phase. The type of appeal is different for different units of the public.

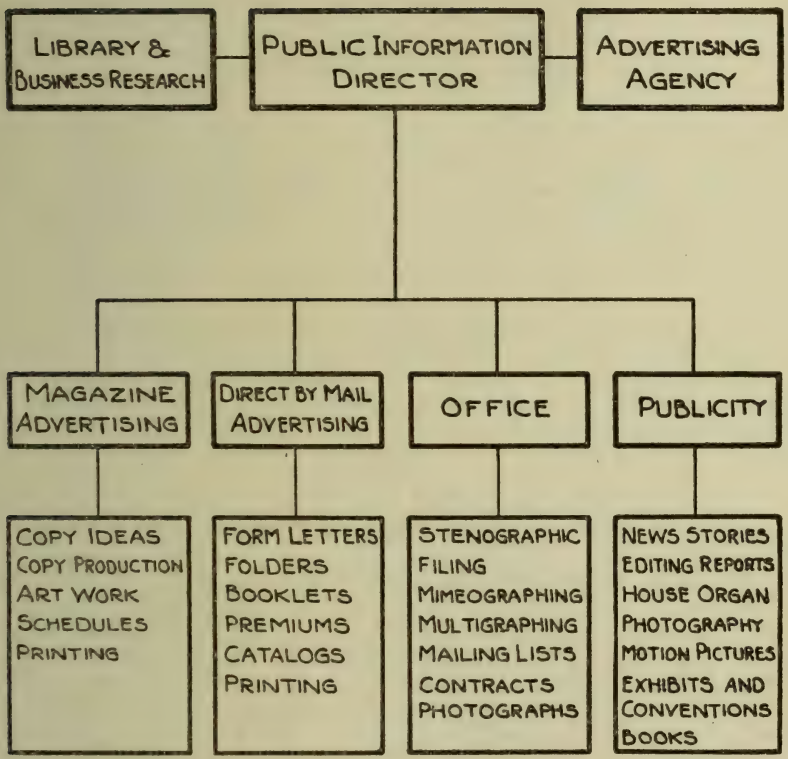


FIGURE 2

Functional Organization of a Typical Public Information Department

Note.—This plan for a public information department is developed for a complete organization acting independently and covering the entire field of advertising, institutional advertising, and magazine and newspaper publicity. No provision is made for service work or bookkeeping, and but small provision is made for co-operative work in educational institutions.

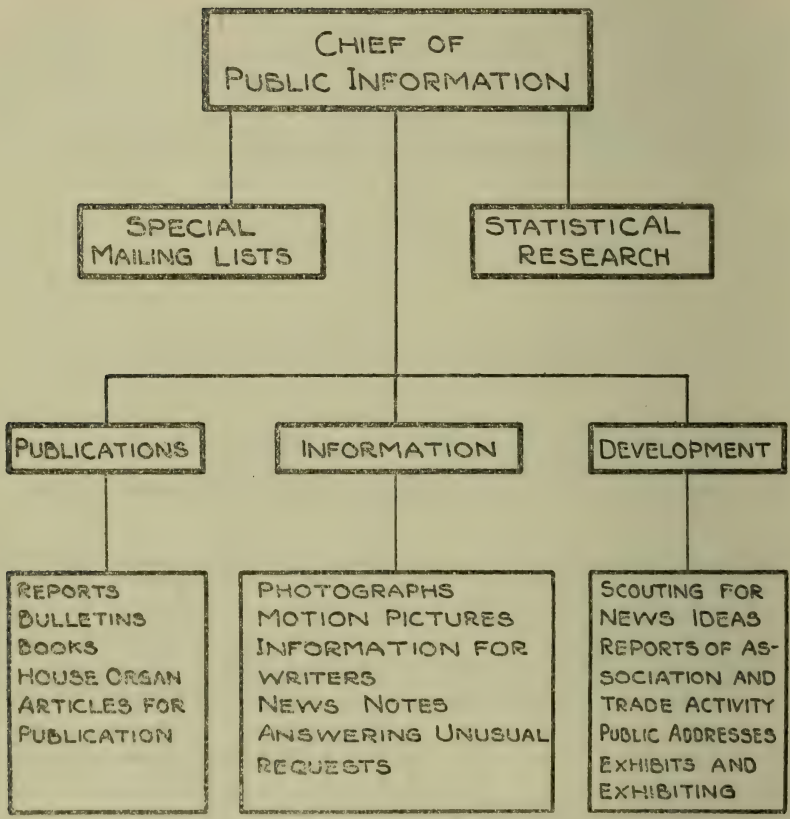


FIGURE 3

Functional Organization at U. S. Forest Products Laboratory

Note.—This plan for public information work is developed as part of a large advertising organization for a business; or independently for an educational or a promotional organization. The plan contemplates stenographic, filing, mimeographing, accounting, and printing service from sources outside of the immediate organization.

CHAIRMAN ROBERTS: I wish to advise you that Mr. Thomas practices what he preaches. When I was in communication with him regarding his address and later in preparing our program he suggested to me the advisability of using the technical press to the largest possible extent in announcing to the public the programs for the sessions of the Standardization Conference and offered us a list of 125 technical journals to whom we could send our announcements and advance programs.

He has given us most excellent suggestions as to how to sell our work to the industry. We believe thoroughly in it and expect to utilize his good suggestions.

I was impressed with the good teamwork that we are pulling off here in our addresses. Mr. Williams gave us in his address the basic reasons for doing the thing; Mr. Thomas has told us how to do it.

This paper is open for discussion, gentlemen. If you have any suggestions to make that have been prompted by this excellent address, or if Mr. Thomas has made any statements you take exception to, we would like for that testimony to go into the record as this is a democratic organization.

MR. LEGGETT: My comment is not so much on Mr. Thomas' paper as on the remark of brother Thomas on John Wesley. My impression of Colonel Roberts of Roberts & Schaefer is that he is more the father of shakers than of methods.

DR. AGNEW: I think that Mr. Thomas has performed a real service in putting due emphasis on the fact that Standardization and Research supplement each other and that they are not antagonistic. The Chief Engineer of one of the concerns that is chiefly responsible for the construction of electric lamps, I think, has put it most excellently. He says that standardization does not mean that we are going to stand still, it means that we are going to agree to improve together. I think that that is a very happy way of putting it.

I would like to also emphasize the point that standardization is in the last analysis a POPULARIZATION OF RESEARCH RESULTS. A peculiarly striking example of that, in a subject quite apart from mining or industrial work, is the fact that more than two centuries before the Christian era a man not only foresaw the general size and shape of the earth, but he measured it with an error of less than 100 miles. That was a really remarkable result for it was an error of only a little over two per cent. Think of the incalculable loss to the human race because there was no machinery for popularizing the results! The human race had to wait 16 centuries to have it painfully rediscovered.

There is another example that Mr. Thomas' address brings to my mind on that same point of research and standardization. This is a practical example—the electric light bulb that we have today. I don't know of an article in the whole of our production that is so thoroughly standardized as that bulb. I don't know any other kind of article that represents the kind of research work that has been expended in its production. A great deal of research work has had to be done in order to solve the technical difficulties in the way of development.

In that particular case standardization followed research with the smallest delay of any of the industrial arts with which I am acquainted. It seems to me that that is an example par excellence of the principle that Mr. Thomas has so ably brought out.

CHAIRMAN ROBERTS: Is there any further discussion of Mr. Thomas' address?

I just wish to announce that the gentleman who made that remark about me a moment ago, Mr. Leggett, is the one to whom we are indebted for securing Mr. Thomas. I didn't have the honor of Mr. Thomas' acquaintance when I was preparing this program and asked Mr. Leggett if he could make some suggestions and he made two most excellent suggestions, of which one was Mr. Thomas.

Our next address is the "Benefit of Standardization as Reflected by Insurance Rates," by Mr. C. B. Butterfield, manager of the Associated Companies. You may not all know who the Associated Companies are, and for those who are not acquainted with their work and activities, I wish to say that they are a group of associated insurance companies, and that they devote a great deal of their time and effort to trying to improve the mining industry as regards safety and economy and otherwise so benefit that industry as to lower these insurance rates, on the theory that has been advanced that in reduction there is profit.

They are a member of our general correlating committee and are actively associated with us in trying to promote safety and improvement generally in the mining industry. We are very greatly honored in having the manager of the Associated Companies give us an address on this subject. Mr. Butterfield. (Applause.)

THE BENEFITS OF STANDARDIZATION AS REFLECTED BY INSURANCE RATES

By

C. B. BUTTERFIELD, MANAGER, THE ASSOCIATED COMPANIES, HARTFORD, CONN.

Mr. Chairman and Gentlemen:

It gives me much pleasure to have been able to accept the kind invitation of your chairman, Col. Roberts, to address this gathering on a subject in which, I feel certain, you are all interested. The subject of compensation insurance is one which touches every phase of industry, and its application to coal mining is of special importance because of the hazards involved. I will, therefore, give you briefly a review of the benefits of standardization as reflected by insurance rates, using as illustrations the methods employed by my Company.

The benefits of standardization in connection with compensation insurance as applied to coal mining are primarily two: first, humanitarian in reducing death and suffering as results of accidents, and second, economic, in reducing the number and cost of claims arising from accidents, with attendant lowering of the cost of the insurance. To this latter must also be added increased productive efficiency due to the lessening of lost time of experienced men and the decreased property damage which damage is so frequently encountered from explosion and other causes where standard safety measures are not adopted.

The coal mine safety standards are a part of the inspection and rating schedule originated by the company which I have the pleasure of representing and consist of a series of regulations setting forth the best mining practice, from a safety point of view, in connection with those operations which experience has shown to be the most prolific source of accident, full consideration having been given to productive efficiency. Each condition contemplated by the standards is given a percentage weight according to its relation, as a source of accident, to the

other conditions collectively; and this weighing is applied as a credit or debit to the minimum rate in the light of the standard or substandard conditions which exist. If physical conditions were the only ones with which we had to deal, our task would be a comparatively easy one. However, as you know, the human element is a most important factor where accident prevention is involved and for this reason our standards require the use of what we term an educational program. One of the first benefits derived from our standards is the result of this educational work which is devised with a view to making the men think and act quickly when emergencies arise. This is accomplished by first arousing interest in the subject through safety committees in which the miners themselves take a leading part. In a mine of average size, we organize a Mine Safety Committee composed of local mine officials, company men and miners, and in addition, a Central Safety Committee consisting of executive officers. In the larger mines the educational work, made effective through these committees, is in charge of an overseer known as a Safety Engineer, whose full time is devoted to working out safety problems and installing safety practices and equipment. The men having been interested in "safety first" are asked to submit to the Mine Safety Committee any suggestions or recommendations which they believe, if adopted, would be a benefit to the mine and its employees. To further the interest in this work a bonus is generally given for the best suggestion accepted by the Committee each month. Safety circulars are published by our Company at regular intervals in the English and foreign languages in order to further the interest in this work. We have recently issued a circular on the subject "Explosion Season," which exists from October 1st to April 15th. This circular informed the miners and mine officials of the approaching explosion season and reminded them to watch for and avoid explosion conditions. The educational work is further augmented each year by a safety meet and by rallies held at various local points and the winners of many of these meets are given, as a prize, the privilege of attending the Annual International First Aid Meet which was held this year in St. Louis. We are deeply interested in instructing the mine employees in First Aid and Mine Rescue Work, many of our Inspectors being experts in this line. The Bureau of Mines and our Inspectors train mine employees free of charge and issue an attractive certificate revealing the fact that the person in question is qualified. It is impossible to estimate the benefits that have been derived from this educational work, but the results are reflected in the humanitarian benefit and the reduction in the number and size of claims presented to the Insurance Companies. For example, in exploration work following mine disasters, we often find miners barricaded so as to protect them-

selves from the onrush of poisonous gases. Such acts of self-preservation are direct results of the training given in our standard educational work.

From the educational phase we pass to the more practical side of the subject and take up the more important physical aspects. In case of accident or disaster it is of prime importance to have facilities for quickly summoning aid, and for this reason we require telephone connection on the surface at all mines, regardless of size. Furthermore, we require an inside telephone connection in every section located more than 2000 feet from the mine entrance in which there are 10 or more men employed, and this inside telephone must be of a standard enclosed type so that it is properly protected from the elements. From an operating standpoint, one of the most important considerations of the mining industry is that of illumination and this question becomes a vital one from a safety viewpoint in gaseous operations. In such mines, our standards prohibit the use of carbide lights and call for permissible electric gas lamps or flame safety lamps. However, full credit is not given for the use of safety lamps, in view of the fact that they do not furnish adequate illumination although either type can be used with safety in explosive gas. In non-gaseous mines, we specify either one of these closed lights or accept carbide lights.

A very essential provision in a mine from a humanitarian view point is the escapeway. In all shaft mines, we require an escape shaft at least 200 feet from the main hoisting shaft, each one of which must be equipped with a hoisting cage or with a stairway kept in passable condition throughout the entire year. In slope or drift operations, we require separate escapeways at a safe distance from the main haulage road. As an illustration of the necessity of escapeways and the actual use to which we place them, it might be of interest for you to know of a mine employing 500 men underground which we recently inspected. From the number of employes, you can readily realize that it was really a small town below the surface. This was a non-gaseous mine having a mine fire sealed off over a large area. The stoppings were so warm that one could not hold one's hand against them, yet the only means of escape which had been provided was directly past these stoppings. Our inspector discovered this serious situation and before we would accept this risk for compensation coverage, we specified that the escapeway paralleling this haulage road past the mine fire must be placed in a safe condition for travel. This required a large expenditure of money but such standardization of this traveling way may mean the saving of the lives of these men.

Our surface requirements are standardized in that we insist upon the electrical equipment being protected by guards of approved designs. This protection is afforded by circuit breakers, grounding, cut-out switches and by wooden and rubber mats,

and all power plants must be inspected periodically by experts. Because of the ropes, cages, haulage engine, safety gates and the like shaft operations are the most difficult ones to operate from a safety view point and we insist that all hoisting ropes have an ultimate breaking strength of ten (10) times the maximum load, that they be properly installed and inspected daily. We require that the top, ground and intermediate landings of the shaft be equipped with automatic safety gates, which operate with the action of the cage; or, in the absence of this equipment, that, an employe be located at each landing while the mine is in operation, and an ordinary gate placed across the opening during his absence.

Approximately 5% of the accidents in mines is due to the rolling stock, and for this reason our standards require that all mine cars be equipped with 6″ bumpers on each and giving a 12″ spacing between cars. In addition, we require that wheels and axles be maintained in a safe operating condition at all times. No employe other than the motorman and trip rider is permitted to ride the trip in either direction.

In mine development, the direction of the main entry is determined by the pitch of the coal seam and the field to be operated, and for operating reasons the entries are driven in certain prescribed directions. Despite the fact that we have escapeways, it is frequently necessary for employes to travel haulage roads and even though all precautions are taken, the releasing of a trip with its resultant runaway often occurs. To provide places of safety for pedestrians in these emergencies, our standards require that shelter holes be cut at frequent intervals along haulage roads and that ample clearance in which employes can walk with safety past locomotives and mine cars be provided. To enable the men to quickly locate places of safety, they are marked by electric lights and whitewashed. With a view to minimizing the chances of derail, our standards require that tracks and roadbeds be in A No. 1 condition, the rails to be of sufficient weight to carry the load and firmly attached to ties. On mechanical haulage roads, we require all joints to be plated and the track to be properly aligned and free from defective construction such as high and low joints.

The increased use of electrical equipment has introduced shock and explosive hazards which must be adequately guarded against. Our Standards require that special attention be paid to the protection of employes from shock and that trolley and feed wires be installed so as to avoid the possibility of mine fires. All rails on main haulage roads must be bonded and all electrical apparatus underground must be of explosion proof construction.

Roof and timbering is one of the most important subjects for standardization with which we have to contend, since falls of roof produce about 60% of all accidents, many of which are fatal.

The roof is a natural condition over which we have no control except that obtained in the method of mining and through our standards of good timbering. The system of timbering required depends upon the method of mining and the width of the entry or working place, but we insist upon three (3) rows of props set on four (4) foot squares for poor roof, while better roof can be safely timbered at greater intervals. In view of the fact that the largest number of men are killed or injured at the working face we require props to be set not further than six (6) feet from the face before shooting and, when the coal is not blown down by explosives, and pick mining is resorted to, we require the props to be set within four (4) feet of the face. We do not overlook the subject of properly spragging undercut coal, as many of our men are killed or injured in this operation as a result of not setting the sprag. This is a turnover hazard which must be carefully guarded by spragging the undercut coal, once in seven (7) feet. So important do we regard the subject of roof that an extra inducement is given to operators by giving special credit for inspection. Many of our mines procure a reduction of twenty-five (25) cents per one hundred (100) dollars of payroll by the installation of exceptionally good inspection service.

The U. S. Bureau of Mines has greatly aided the Mining Industry by experimental work in explosives for gaseous mines. We have permissible explosives which are approved by the Bureau of Mines and can be used with safety in gaseous operations. When permissible explosives are used in the quantities and in the method prescribed by the U. S. Bureau of Mines, adverse results need not be feared. Permissible explosives are short flamed and the quick flash permits the powder to do its work without the ignition of gas. The subject of explosives is not one of so much importance in non gaseous mines except that we ask for the installation of permissible explosives but will accept black powder; and do all in our power to discourage the use of dynamite. The firing of shots, however, presents a catastrophe possibility in gaseous and dusty mines and our standards require the employing of shot firers who must load, tamp and fire all holes. These men are experts in their work and have no other duties. In order to protect the lives of shot firers we specify the use of electric batteries with 100 feet of lead wire thus permitting the shot firer to obtain a place of refuge before igniting the charge.

Unaided by mechanical means fresh air penetrates mine workings but a short distance. A study of this subject deals with but one standard for safe operation and that is mine fans. We specify the fact that certain prescribed volumes of air must be forced into the mine according to the number of men employed and the number of animals used underground. This requirement governs the size of the fan, which must be installed on the surface, be of a reversible type, and strongly and tightly constructed

and enclosed with fire resistive material. In gaseous mines we specify explosion doors which, in case of a mine expolsion, relieve the pressure thereby saving the fan, which must be operated twenty-four (24) hours per day. The air currents circulate through a mine like electricity through an electric circuit. There must be an intake and return air course, and in order to provide this system cross cuts between entries must be closed, our standards requiring that such stoppings be constructed of concrete, brick tile or masonry with the exception of the last three cross-cuts, which may be constructed of wood. This combustible material is permitted at these points in order to localize an explosion at the working face.

The possibilities of catastrophe are grouped in our standard under the subjects, gas, dust, solid shooting, mine floods and fires. The gas hazard is reduced to a minimum by the use of closed lights, adequate ventilation and permissible explosives. The dust hazard is taken care of by sprinkling or otherwise rendering inert. We discourage the practice of solid shooting and in any mine in which coal is shot off the solid, we require shot firers to inspect, load, tamp and fire all holes. With this requirement we also specify permissible explosives regardless of whether the mine is gaseous or non-gaseous. All men must be out of the mine when coal is shot off the solid with the exception of the shot firers and other persons delegated by the Mine Foreman to safeguard property.

We carry many mines exposed to the flood hazard, some of which are in themselves a natural drainage basin, and large volumes of water are confined by means of dams. We also encounter a flood hazard from the collection of large volumes of water in old workings. In these cases we require barrier pillars to be maintained in accordance with the Mine Law, but, if the Mine Law permits barriers of less than fifty (50) feet in thickness, we will not accept them as standard. When an entry or working place is driving toward a flood area we require advance bore holes to be kept twenty (20) feet ahead of the working face.

Mine fires are not uncommon in coal mines, many of them having burned for years, it being apparently impossible to extinguish them. It is our endeavor, therefore, to restrict mine fires to certain areas and our standards require that they be sealed off so that no noxious gases from the fire may be carried through the mine. A daily examination of the seals is insisted upon.

The humanitarian aspects of the foregoing phases are of vital interest to the community and the nation as a whole. The toll of human life and limb taken by our industries annually must impress all thinking citizens, not only from the human but from the economic side of the question. You will, I am sure, agree

with me when I say that the first thought of any industrial management should be the preservation of life and the mitigation of suffering and disablement to the ultimate degree. The economic aspect is not only reflected in the increased cost of production due to the rating on compensation insurance but entails the loss, through disability or death, of a productive worker, which is, of course, the unit in our economic system. In addition to this, although the compensation benefits provided by law are liberal, the injured frequently becomes a charge upon the community in one way or another. As an indication of what the introduction of compensation insurance has accomplished along these lines, I want to call your attention to certain statistics on the subject of fatal accidents in coal mining operations. For this purpose I have chosen the State of Pennsylvania, where the compensation law became effective on January 1, 1916, and has been in operation longer than in any other state. Our statistics indicate that during the five years from 1911 to 1916, inclusive, there were 3.11 fatal accidents per million tons of coal mined in that state and that during the five years following the inception of the law fatal accidents were reduced to 2.81 per million tons of coal mined. A similar decrease in the death rate has been recorded in other states and like reductions in the number of accidents entailing total or partial disability have been effected. These reductions are without question direct results of the standardization of mining operations from the viewpoint of safety and have been the means by which reductions in the cost of compensation insurance to their present low levels have been brought about.

Turning to a consideration of the strictly financial side of the question we must first consider the operation of the schedule earlier referred to. The changes for sub-standard conditions carry the same weight in all states, but this weight is necessarily on a percentage basis for the reason that the base rates of all states are not the same. This is accounted for by the difference in requirements of the compensation laws in the various states, some of which are more liberal in their awards and more comprehensive in scope than others. As an example, in the state of Kentucky we must earn the average on all mines of $3.40 per hundred dollars of payroll, while in Alabama it is only necessary, in order to successfully carry on the business to earn an average or base rate of $3.15. These differences in base rates give to item values different charges in parts of a dollar, but the item values having the same weight operate in similar proportion from state to state. The minimum rate (which as a rule is 60 per cent of the base rate just referred to) is taken as the basis for applying the charges produced on the schedule rating plan. The sum of the charges when added to the minimum give the schedule rate for the mine in question, suitable credit

being subtracted from the total for educational and inspection work.

As regards the application of schedule rating, we require that the mine have a payroll of at least $10,000 per annum, while mines of sufficient size to develop a payroll of $100,000 in eighteen (18) months must under the insurance law be experience rated. The experience rate is based upon the actual loss ratio sustained through accident, and is effected by applying the debit or credit, according to the accident experience, to the schedule rate. Thus with favorable experience which usually results from co-operation by the management in our standardization program, even greater reductions in rate can be affected than those which have already resulted from the application of the schedule rating plan. We have many risks that have had the rate reduced by experience credit as much as 75 and 80 cents per hundred dollars of payroll, while others, where an unfavorable accident frequency has been experienced have of course been debited.

From this it will be seen that much depends upon the operator in faithfully complying with the requirements of our standards, and, with the exception of a very few cases where natural conditions are extremely bad, I can say that where the mine officials have co-operated with us in standardization there has been an appreciable lowering of the rate. This lowering refers to current policies in addition to which we must consider the reductions which have been effected in base rates since the inception of the compensation law, as a result of the improvement through standardization of the mining industry in general.

We have then two distinct financial benefits of standardization as applied to coal mine compensation insurance: the direct benefit, in the reduction of rates because of the favorable accident record brought about by the introduction of safety measures, and the indirect economic result in lessening the number of disabled men, and widows and orphans incapable of self-support. In addition and of even greater importance we have the great satisfaction of preserving life, minimizing disability and preventing unnecessary suffering.

CHAIRMAN ROBERTS: I do not know of any better testimony to offer to the work which we are trying to carry on than to note the parallel between the great work carried on by these Associated Companies and the work which we are trying to do. It is for that reason that we are working together now through the General Correlating Committee to try to accomplish similar results, although our work is very much broader in its subject matter than theirs.

At our forenoon session of the General Correlating Committee, we decided to appoint a sectional committee with membership from the several national organizations that are interested in this work, to try to formulate a new and better state mining law to offer to the states for the protection of life and property in the mines of this country. I think that this address will indicate to us that the Associated Companies have a vast amount of valuable data that they can contribute for the use of

this committee in formulating these basic regulations for our state mining laws.

You understand that these Associated Companies have no way of compelling the adoption of their standards, but they have a most excellent method of encouraging the adoption of those standards because your insurance rates are in proportion to the extent to which you adopt these safety regulations. In other words, your mine is classified according to its safety, and that is a very great inducement for the gradual adoption of their safety regulations.

In hearing the statistics regarding the reduction of fatal accidents, I recalled that Mr. Callbreath, the Secretary of The American Mining Congress, made the statement in an address at a luncheon day before yesterday that in a recent year the fatal accidents in the United States were over 3,200, and that last year, 1920, fatal accidents were about 1,900 and that this great reduction in the loss of life in the mining industry, despite the fact that production had very greatly increased with many more mines and larger production, was due to the efforts of such organizations as the Associated Companies, the National Safety Council, The American Mining Congress and those who are working for improvement in the mining industry, and I should also add the Bureau of Mines, because their work is at all times very comprehensive.

Are there any questions that you would like to ask Mr. Butterfield regarding his address?

If not, we will have our next address on the Standardization Movement in Canada. When we were preparing this program we thought it would be very appropriate to hear from our Canadian friends and learn what they were doing along the lines on which we are working. We finally induced Dr. E. J. Durley, Secretary of the Canadian Engineering Standards Association, to present an address with the understanding that he would come and deliver it, if possible. He found it impossible to be here this week; he therefore mailed his address to us and asked that Dr. Agnew, his very good friend, should read it.

DR. AGNEW: It is indeed a pleasure to present Dr. Durley's address. (Applause.)

THE STANDARDIZATION MOVEMENT IN CANADA

By

R. J. DURLEY, SECRETARY, CANADIAN ENGINEERING STANDARDS ASSOCIATION.

The first steps towards the organization of engineering standardization work in Canada were taken in 1918, when, at the suggestion of the British Engineering Standards Association, a committee of prominent Canadian engineers and industrialists was formed to deal with the matter. This Committee, after a good deal of preliminary work, came to the conclusion that a distinctively Canadian Standardization body was desirable, and that owing to the industrial and economic conditions existing in Canada, the Committee or Association to be formed should have a wider scope than could be possessed by any committee forming part of a British or American organization. Industrial and engineering work in Canada is, however, so largely influenced by our proximity to the United States, and by the close commercial relations existing with Great Britain, that any Canadian Engineering Standards Committee or Asso-

ciation must necessarily keep in the closest possible touch with the bodies doing similar work in those countries.

It was accordingly decided to form an Association, the constitution of which was to be modelled on that of the British Engineering Standards Association and which should be fitted to act as the central organization for industrial standardization in Canada. It was thought essential that this body should be supported and largely maintained by the industries concerned, while at the same time the support of the Federal Government was considered indispensable.

The original Committee was accordingly enlarged and expanded, and in 1919 the **Canadian Engineering Standards Association** was incorporated by Dominion Charter. Its **Main Committee,** the duty of which is to direct and manage the affairs of the Association, to appoint the chairman and members of the working committees, and to examine and approve proposed standards before publication, is composed of forty-three members, part of the membership being nominated by such bodies as the Engineering Institute of Canada, the Canadian Institute of Mining and Metallurgy, the Canadian Manufacturers Association, the Engineering Schools of the Universities, and other public and semi-public bodies, while certain other members are nominated by the principal departments of the Dominion Government, and the remainder are co-opted as being desirable representatives of important industries such as railway work, pulp and paper manufacture, steel manufacture, and the like.

The Main Committee has appointed a number of **Sectional Committees,** each charged with the duty of supervising the activities of the working committees in some particular branch of industry. There are at present ten of these sectional committees dealing respectively with:

Aircraft Parts,
Electrical Work,
Rails and Track,
Wire Rope,
Steel Bridges and Construction,
Screw Threads,
Machine Parts,
Mining Machinery,
Steel,
Cement and Concrete.

Under each Sectional Committee there are organized the necessary **Sub-Committees** (at present eighteen in number), which are actually responsible for the technical work of formulating proposed standards, and whose members are appointed by the appropriate sectional committee, subject to the approval of the Main Committee. Whenever necessary, **Panels** (usually

consisting of a smaller number of members) are formed under the Sub-Committees to study and report on minor points which may require detailed enquiry or investigation.

It is the aim in every case to include in the membership of the working committees, representatives of all the important producing and purchasing interests concerned, together with such technical advisers as may be considered desirable. The actual discussions as regards technical details are thus carried out by specially chosen representatives of the manufacturers and purchasers, and the various interests, whether of the producer, user, or the engineer, are safeguarded, since all these parties have a voice in the decisions reached.

The services of the various Sectional and Sub-Committees are, of course, available for the periodical revision of their publications, for which arrangements are regularly made in order to avoid any risk of retaining a standard in use after changes in practice have rendered it obsolete in any respect.

From the inception of the work, the Main Committee has adopted the principle that action shall only be taken in cases where a request for standardization work is received from some responsible organization or firm, and in each case adequate enquiry is made, by circularizing the industry or otherwise, to determine whether the proposed activity will have the support of the parties concerned.

In Canada, as in other countries, some popular uncertainty seems to exist as to the use of the term "Standardization," some taking it to include only the work of measuring, calibrating, or comparing scientific instruments, measures of length, and so on, while others understand that it refers to the preparation of such designs, dimensions or specifications in industrial, manufacturing, or construction work as will be generally accepted and worked to by all concerned.

The latter is, of course, the line of work along which the activities of the Canadian Engineering Standards Association are directed.

It should be noted also that the scope of the Association is not considered to include the carrying out of any tests which may be required to determine whether or not a given product complies with its specifications or dimensions. The duty of the Association has been done when a standard has been formulated and published in such a form as to meet with the general approval of the interests affected, and when provision has been made for its periodical revision.

The experience of the last two years has shown that standardization work in Canada presents features not only of particular interest but also of special difficulty. While it would appear at first sight that in many instances British or American standards could be adopted without change, owing, in the former case,

to the fact of geographical proximity and industrial connection, and in the latter, to the intimate commercial relationship existing, this is not always found to be the case in practice. Differences in industrial conditions and in the class of material and workmanship available, differences in climatic conditions, and in legislative restrictions, tend in many cases to make differences in practice necessary or advisable.

Our Committees have to bear in mind in framing their requirements that while domestic industry must receive the first consideration, the interests of the purchaser and importer are also affected, since in many branches it is necessary for us to import not only material in a raw or semi-finished condition, but also manufactured machinery or completed engineering products.

Speaking generally, it may be said that as regards dimensional standards, as, for instance, in ball bearings, screw threads, gearing, and the like, American practice is usually followed, and in many cases it may be found desirable to adopt American standards without alteration. In other cases, as, for example, the preparation of specifications for material, the influence of local conditions is often strongly felt, and in such instances specifications of our own, possibly differing from both British and American practice, are being developed. The closest co-operation is, however, being aimed at, both with the British Engineering Standards Association and with the American Engineering Standards Committee, and as it is even hoped that in the case of certain British and American Standards it may be possible for the Canadian organization to assist in bringing about international agreement.

Among the American Standards which have received wide acceptance in Canada may be mentioned the United States Standard Coarse Thread, Fine Thread, and Pipe Thread, the rules of the Society of Automotive Engineers affecting the automobile industry, and the Standardization Rules of the American Institute of Electrical Engineers as applied to electrical products. Further, in connection with railway work, the interchange of traffic obviously makes it necessary for Canadian practice to agree substantially with American Standards as regards locomotive, car, and track work, and our railway bridge specification is in general agreement with the practice adopted by the American Railway Engineering Association.

During the past eighteen months our Association has published the following:

No. 1, 1920 — Standard Specifications for Steel Railway Bridges.

No. 1A, 1920 — Standard Specifications for Steel Railway Bridges. (Separate reprint of Material Specifications.)

No. 2, 1920—Standard Requirements for Distribution Type Transformers.

No. 3, 1921—Standard Specifications for Galvanized Telegraph and Telephone Wire.

The following are in preparation and will shortly be issued:

Standard Specification for Steel Highway Bridges.
Standard Specification for Steel Railway Bridges (new edition).
Standard Specification for Wire Rope for Mining and Dredging Purposes.
Standard Specification for Portland Cement.
Among the subjects for which working committees have been, or are being, formed are the following:
Canadian Electrical Code,
Incandescent Lamps,
Distribution Type Transformers,
Station Type Transformers,
Galvanized Telegraph and Telephone Wire,
Watthour Meters,
Wood Poles,
Rating and Testing of Electrical Machinery.
Wire Rope for Dredging Work,
Wire Rope for Mining Work,
Wire Strand,
Steel Railway Bridges,
Steel Highway Bridges,
Rivet Heads,
Mining Drill Chucks and Steel,
Material for Steel Forgings,
Cement,
Concrete and Reinforced Concrete,
Impedance in Transformers,
Steel Reinforcing Bars,
Flexible Steel Wire Rope for Aircraft,
Steel Tubes for Aircraft,
Steel Sheets for Aircraft.

A few notes on some of these may be added:

In Canada, provision for the public safety (as affected, for instance, by electrical installations and equipment) is not under federal jurisdiction, the various provincial governments holding this responsibility. The Provinces have shown great diversity of method in dealing with the matter, in one case (the Province of Ontario) a very complete code of rules having been adopted as applying to all electrical installations in the Province, and covering the same ground as the U. S. National Electric Code, the Underwriters Specifications, and the National Electrical Safety Code. In certain other localities the question of electrical regulations has been placed in the hands of commissions

whose powers are not so wide, and in many cases no adequate legislative action has been taken.

The rules of the U. S. "National Electrical Code" as applying to fire hazard are recognized and used by the various Fire Underwriters' Associations in Canada, but these are not specially applicable to life-hazard and have no legal force except where they have been officially adopted by local authorities, in which case they are commonly supplemented by additional rules which exhibit much diversity. As a result, the manufacturers of, and dealers in, electric appliances and equipment are suffering considerable inconvenience, as equipment or fittings may be approved for use in one locality but may be regarded as quite unsuitable in a neighboring city or province.

The Association is now endeavoring to arouse Dominion-wide interest in this matter, with the view of organizing a thoroughly representative committee and bringing persuasion to bear upon the various Provincial Governments in order to unify their requirements and remedy the present unsatisfactory conditions. In this work there is no doubt that the results of the activities of the two American committees, dealing respectively with the National Electrical Code and the National Electrical Safety Code, will be fully considered and appreciated.

Much of the Safety Code work now being actively pressed forward in the United States is of great interest to Canadian industry, and in many cases, such as the Elevator Safety Code, and the Safety Code for Logging and Sawmill Machinery, we have received cordial invitations to co-operate, which have been greatly appreciated.

The Standardization Rules of the A. I. E. E. are very largely, if not universally, worked to in Canada, especially in connection with the rating and testing of electrical machinery, but they have so far not received official endorsation from any public or industrial body in Canada. The Association is forming a representative committee with instructions to report upon this question and advise how far it will be desirable to adopt these standards formally.

The publications of the Association have hitherto not included any standards of a dimensional nature, and at present it seems likely that comparatively little independent work of this particular kind will be required in Canada. In the field of specifications, both for materials and engineering products, however, this condition does not hold good, and requests have been received for the formulation of standard specifications for a number of materials and products, some of which have not yet been dealt with by American Standardization authorities. Among these may be mentioned **Wire Rope for Mining Purposes,** a specification for which, as already stated, is now in the press. This specification lists the regular constructions to be adopted

as standard by makers for Canadian use, and while avoiding controversial points as far as possible, prescribes the necessary tests which are regarded as being necessary to protect the user, manufacturer and importer against rope of inferior material and construction.

Another item of interest to the Standardization Conference of The American Mining Congress will be the question of **Mining Drill Chucks and Steel.** A sub-committee was formed by the C. E. S. A. for the study of this question in 1920, and a good deal of information has been collected as regards the diversity of practice in the various mining districts of Canada. It is desired, if feasible, to limit the number of sizes and shapes of steel in use, and also to obtain as much unification as is possible in the design of drill chucks. Our Committee is naturally very desirous of working along lines parallel to those adopted in the United States, and, after a survey of the subject, is awaiting the results of experimental work and developments in American practice which are understood to be in progress.

It is hardly necessary here to go over the work of all of our Committees, but the foregoing notes will have sufficiently emphasized the desire on the part of all concerned for effective co-operation with the American standardizing bodies. Our relations with the working committees of the important technical organizations, as well as with their co-ordinating body, the American Engineering Standards Committee, have been and continue to be very cordial, and the Main Committee of the C. E. S. A. is happy to take this opportunity of drawing attention to this fact.

MR. McGRATH: Does any one wish to discuss any points in the paper just read? I wish to say that these papers were prepared for publication in addition to being delivered in person, and we realize that a great number of the papers contained data that is a little bit dry to listen to, and in finishing up the standardization work Colonel Roberts is of the opinion that in the future he will be able to get his committees to group their reports in such a way that they can refer to their statistical data and not read it, but it will be included in the printed reports.

I might also say that a great number of the members realize that this will be printed and they expect certain discussions on it and they all look forward to the publication of these speeches; and if any of you have any ideas to present, they should come up now. Because of the fact that we have about five different conferences going on at one time, they cannot attend them all and those present are expected to discuss the points for them in a way. Of course they should not do it, but they do.

Our last speaker on the program is Col. Warren R. Roberts, but before announcing Colonel Roberts, I wish to state that in the metal mining industry about 80 or 90 per cent of all the metal mines are not operating at the present time; or if they are operating, they are operating at a very curtailed output, so that the committee members were not able to be present except in very small numbers.

The metal mines are from 1,000 to 2,000 miles from Chicago and they were not able to make the trip to attend this Convention, but they are

all looking forward to the publication of these reports and this year they have promised us these reports will be published within six weeks.

I now wish to announce that we will have an address on "National Coordination of Standardization through the General Correlating Committee," by Col. Warren R. Roberts. (Applause.)

CHAIRMAN ROBERTS: Mr. McGrath, in announcing that Dr. Secrist could not be present, did not say he was in the hospital. We regret that Dr. Secrist was unable to even prepare an address to be read as he was taken ill two or three weeks ago and is still ill.

My address will be very short and I would postpone reading it and have it printed, only there are a few thoughts in it that I want the members, who are present to have now regarding this coordination of our work with other organizations.

NATIONAL CO-ORDINATION OF STANDARDIZATION THROUGH THE GENERAL CORRELATING COMMITTEE

By

COL. WARREN R. ROBERTS, PRESIDENT, ROBERTS & SCHAEFER COMPANY, CHICAGO.

The two special programs of the Standardization Conference for Wednesday forenoon and Thursday afternoon, including the selection of the subjects and the speakers, were arranged some time since with a great deal of care to cover, in as thorough a manner as possible, the general subjects selected for these two sessions.

As originally planned, the subject which I am now to discuss was given to Prof. E. A. Holbrook, Assistant Director of the U. S. Bureau of Mines, as he is the Chairman of the General Correlating Committee. However, in developing these two programs it became necessary to allot a different subject to Prof. Holbrook on Wednesday forenoon, and the speaker, being Vice-Chairman of the General Correlating Committee, was under the necessity of taking his place on today's program.

I did not realize how formidable a sounding subject had been selected for this address until I handed our program to one of my friends and called his particular attention to the subjects and speakers for these two special sessions. My friend read through these two programs carefully until he came to No. 7, for Thursday afternoon, when, after considerable hesitation, he endeavored to read the title of this number, and after stumbling through all these long words, he was finally stumped on "Correlating" and ended by saying, "Hell of a subject." I admitted the allegation, but then explained to him that this subject was not selected because of the many high-sounding words, but because it correctly described the subject matter for this address.

A full statement of the organization and development of this General Correlating Committee was given at our last Standard-

ization Conference, and is contained in a Standardization Bulletin issued recently by The American Mining Congress. I will, therefore, give you only a statement of the necessity for this committee in carrying out the standardization program of the several member bodies of the committee.

There are several national engineering societies and industrial organizations that have committees working on programs of "Standardization," "Safety," and kindred subjects which somewhat parallel the work of the Standardization Division of The American Mining Congress. It therefore seemed advisable to organize this committee with representation from each of the societies or organizations that were interested in this work of Standardization for the mining industry. Therefore, about a year ago, this committee was formed and proceeded to develop plans for correlating the work of the various committees referred to above.

Since our last Standardization Conference this committee has been partially reorganized and considerably expanded to include other societies and organizations making application for admission to this work.

As now constituted, the committee is composed of two classes of memberships, viz., ACTIVE and ASSOCIATE MEMBERS.

> "Organizations entitled to active membership on the Committee are those national bodies whose sole interest is in mining. National organizations only a part of whose work lies in the mining field are entitled to representation on the Committee as ASSOCIATE MEMBERS, without vote, but to be consulted whenever affairs relating to their parts of the industry are under consideration."

The following is the personnel of the present committee:

ACTIVE MEMBERS

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

Howard N. Eavenson, Consulting Engineer, Pittsburgh, Pa.
Graham Bright, Westinghouse Elect. & Mfg. Co., East Pittsburgh, Pa.

THE AMERICAN MINING CONGRESS

Charles A. Mitke, Consulting Engineer, Bisbee, Ariz.
Col. Warren R. Roberts, President, Roberts & Schaefer Co., Chicago, Ill.

NATIONAL SAFETY COUNCIL

B. F. Tillson, Assistant Superintendent, New Jersey Zinc Co., Franklin, N. J.

S. J. Williams, Secretary and Chief Engineer, National Safety Council, Chicago, Ill.

U. S. BUREAU OF MINES

Prof. E. A. Holbrook, Assistant Director, U. S. Bureau of Mines, Washington, D. C.

O. P. Hood, Chief Mechanical Engineer, U. S. Bureau of Mines, Washington, D. C.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, New York City

F. L. Stone, General Electric Co., Schenectady, N. Y.

THE ASSOCIATED COMPANIES, Hartford, Conn.
C. B. Butterfield, Manager.

REPRESENTED BY

J. H. Griftner, Mining Engineer, Associated Companies, Hartford, Conn.

ASSOCIATE MEMBERS

NATIONAL SAFETY CODE COMMITTEE

The General Correlating Committee function under and report to the American Engineering Standards Committee and represent this committee on all matters of Standardization as applied to the mining industry. At the last meeting of the committee "it was agreed that the functions of this committee should be to suggest to the American Engineering Standards Committee subjects for standardization, recommend sponsors, define the scope and limits of a proposed standard; assist in adjusting conflicts or clearing up ambiguities; follow up work under way, and report from time to time upon progress made within its field of activities."

Since the member bodies of this General Correlating Committee have committees working on subjects, some of which wholly apply to the mining industry and others which only partially apply, and since some of these organizations have developed a very considerable program on Standardization, as applied to the mining industry, and to prevent as far as possible the interference with such work, it has been arranged that the method of procedure shall be as follows:

Each of the members of the committee are to pursue their present programs of standardization and whenever any of them have completed any patricular portion of their work, which they wish to submit to the industry as a standard, such work shall be first submitted to the General Correlating Committee, who in turn will submit it to the various members of the committee for their consideration and approval, or for suggestions.

Should such work be approved by all members of the committee, then it is submitted by the committee to the American Engineering Standards Committee as an American standard.

Should it develop that there are sufficient suggestions or revisions to the work as submitted by the members of the committee, then a sectional committee will be formed to review such work, this sectional committee to be composed of representatives of all members of the General Correlating Committee who are interested in the subjects submitted.

This sectional committee will then revise and approve such work and re-submit it to the General Correlating Committee for submission to the American Engineering Standards Committee as an American standard.

Members of the General Correlating Committee who are much interested in any such subjects submitted are to act as joint sponsors with the member submitting such subjects for revision, while other members who are only partially interested in such subjects are to have representatives on the committee to hear the evidence, make suggestions, etc., but do not have a vote in reaching any conclusions regarding the subject.

It is very interesting to know that while this General Correlating Committee has been organized only a short time, and that while the very nature of their work of harmonizing the activities of all the societies and organizations interested in standardization of mining methods and equipment, that they have made very material progress—first, in having completed a good, workable organization, adopted regulations for directing this important work as outlined above, and now have under consideration from the members of the committee the following important subjects on which sectional committees will doubtless be formed at a meeting of the General Correlating Committee to be held during the present week here in conjunction with the Standardization Conference:

SAFETY CODE FOR LADDERS: The American Society of Safety Engineers, having a committee preparing a "Safety Code for Ladders," have inquired of our committee whether we would be interested in that portion of their subject as applied to mine ladders, etc., and have been advised that several members of the General Correlating Committee are interested in this subject and will wish to be represented on any Sectional Committee formed to consider the matter.

MINE VENTILATION. The American Society of Heating and Ventilating Engineers, having accepted sponsorship for a "Safety Code for Ventilation in public, semi-public and industrial buildings," have inquired whether our committee would be interested in the formation of a Sectional Committee to deal with the ventilation of mines, and have been advised that The

American Mining Congress and some other members of our committee are not only interested in this subject but have committees working on Mine Ventilation with a well developed program.

UNIFORM MINING LAWS: At the last meeting of our committee it was decided to inquire from each of the organizations represented on our committee, if they wished to be represented on a proposed Sectional Committee for formulating basic mining regulations, it being understood that this Sectional Committee would undertake to draw up the minimum requirements for a good and uniform State Mining Law.

The Chairman of our committee advises that several of our members have responded favorably and that such Sectional Committee will doubtless be formed at the present meeting of the committee.

The U. S. Bureau of Mines has submitted to our committee three proposed tentative American Standards:

(1) Safety Rules for installing and using electric equipment in bituminous coal mines.

(2) Portable electric mine lamps.

(3) Storage battery locomotives for use in gaseous mines.

The Bureau of Mines have been made sole or joint sponsor on Sectional Committees to be formed for considering these three subjects and other member bodies of our committee have been asked to advise whether they are interested in these subjects, and therefore whether they wish to join the Sectional Committees as joint sponsor or simply as members to consider these proposed standards.

Sectional Committees for these subjects will doubtless be appointed at the present meeting of the committee.

The above list of important subjects, under consideration by our committee, are given simply to illustrate the present activity of the committee and to indicate the wisdom in having formed such a general committee to co-ordinate the work on mine standards being carried on by many different societies and organizations.

We are hoping through this Committee not only to direct Standardization for the mining industry, but to awaken in the member bodies a realization of the fact that through Standardization we can most easily and quickly carry out the national programs of Safety and Economy which these member bodies have been diligently fostering for many years.

MR. McGRATH: Has any one any suggestion to make upon Colonel Roberts' report?

As you will note from your program, the fifth general session of the Convention will convene here in this room at eight p. m. this evening

and you can all see that they have a very interesting program for tonight. I think that we all appreciate the excellent program that we had and the very instructive reports and papers that were submitted.

I wish to remark for a moment upon the paper presented by Mr. C. R. Thomas on popularizing being the same as standardizing. You gentlemen probably do not realize that as much as we do in the copper industry. Last March the copper industry realized that they had one year's unsold production on hand. So they closed down their mines practically in toto. I think there are only about three copper mines in the United States that are operating at the present time. They had a standard product but they couldn't sell it. The reason for that was the fact that during the war the government had issued instructions that all copper mines should reserve 50 per cent of their production each month for the consumption of the government. The copper mines reserved that 50 per cent and endeavored to sell the other 50.

About three months before the Armistice the government failed to take this fifty per cent, so on November 11, 1918, the copper mines had one and a half month's production which they had supposed was sold, and they had quite a lot of their other unsold product; but in the hope that peace would be signed and trade relations with Germany and Europe established, they went on producing. Of course, as we all know, that was not carried out and they found in March of last year that they had one million pounds of unsold copper.

The reason why they couldn't sell this copper after the armistice was the fact that the aluminum people, the steel people and other people had come in and supplied with their products the demand that the copper people had been unable to take care of by supplying 50 per cent of its production to the government.

So that now the copper people find that they must get back that trade and they have gone out to popularize their product and are instituting a method of propaganda and a campaign to educate the people to the value of copper.

For that reason the paper of Mr. Thomas appealed to me very strongly and I think will appeal strongly to everybody in the copper industry. Popularizing is about the same as standardizing, because if you don't popularize, there is not very much use in standardizing.

If there is nothing further, this meeting will now stand adjourned.

(The meeting then adjourned at 5 p. m.)

ADJOURNMENT

METAL MINING BRANCH

October 17, 1921, 2:30 P. M.

The first meeting of the Metal Mining Branch of the Standardization Division, Twenty-fourth Annual Convention of The American Mining Congress, convened at 2:30 o'clock, Monday afternoon, October 17, 1921, Mr. T. O. McGrath presiding in the absence of the general chairman, Mr. Chas. A. Mitke.

TEMPORARY CHAIRMAN McGRATH: Mr. Chas. A. Mitke, our General Chairman, being absent in South America on professional business, I have requested Mr. William B. Daly, Asst. General Manager, The Anaconda Copper Company, with whom most of you are probably well acquainted, to take charge of the Committee work, and the reports of the Committees during the coming sessions of the Standardization Conference.

(Mr. Daly then took the Chair.)

ACTING CHAIRMAN DALY: We all regret very much that Mr. Mitke is not here in person to handle this Conference. The purpose of this meeting today, as most of you who were present at the joint meeting this morning already know, is to try to get together to thresh out the reports of the Chairmen of the different sub-committees of this branch. I regret very much to state that some of the reports have not progressed as far as we would like. For this reason I believe the better method of procedure would be to take up and discuss each report as far as it has gone. Before proceeding further I shall call the roll in order to ascertain how many members of our various committees are present.

(A roll call indicated that owing to the unprecedented condition in the metal market very few committee members were in attendance. However, as a number of mining men, and visitors interested in mining subjects were present it was decided to discuss each report as it was read, in order to ascertain the opinions of mining men, other than committee members.)

REPORT OF CHAS. A. MITKE, CHAIRMAN GENERAL COMMITTEE

The metal mining branch of the standardization division at present consists of ten committees, covering the following subjects:

DRILLING MACHINES AND DRILL STEEL.
UNDERGROUND TRANSPORTATION.
FIRE-FIGHTING EQUIPMENT.
STEAM SHOVEL EQUIPMENT AND OPERATIONS.
MECHANICAL LOADING UNDERGROUND.
METAL MINE VENTILATION.
MINE TIMBERING.
MINE DRAINAGE.
METAL MINE ACCOUNTING.
WELFARE.

These are all subjects of especial interest to metal miners, not only in the states, but in metal mines the world over.

All of these committees are at work and making progress. While the progress made thus far is such that it does not readily lend itself to publication, nevertheless it is of the utmost importance in paving the way for the standards which the committees hope eventually to work out.

The standardization movement is not a matter for immediate decision, but rather a slow growth, the details composing the various units of standardization being worked out by engineers located in various mining camps throughout the country. In this connection it may be stated that there are general inquiries by the various departments of leading mining companies for simpler methods, a more economical classification of products, a reduction in the number of stages or routine, and an extension of the previous standards to much further dimensions. Naturally, these inquiries are largely in the nature of investigations, which are taken up and discussed pro and con before they can be crystallized into local standards.

The work of the Metal Mines Branch has been extended during the present year by the addition of two new committees on Metal Mine Accounting, and Metal Mine Drainage, both of the utmost importance to mine operators.

Both the Metal and the Coal sections of the Standardization Division of The American Mining Congress are working harmoniously with the American Engineering Standards Committee, the United States Bureau of Mines, and other mining organizations interested in the standardization movement. It is believed that this co-operation will be of the utmost importance when the time arrives for the formation of national standards and their adoption by the metal and coal industries.

As you are aware, commencing with January 1, 1921, there was a drastic curtailment of metal production, which resulted in the loss of employment to many members of mining organizations. Shortly after, there were complete shutdowns at many copper, lead and zinc mines. As a consequence, a number of our committee members have been forced to seek other employment, which has naturally retarded the work of standardization.

However, in spite of drastic curtailments, reductions of working forces, etc., such times as the present are the crucial occasions when it is most important to prepare for the future by the development of more efficient methods, and by standardizing present operations and equipment, in order to lower future mining costs.

It is earnestly hoped that in the near future there will be a revival of the metal business, and that during this coming year, each and every member of the committees of the Metal Mining Branch will personally assume the responsibility of making some individual contribution to the great standardization movement.

PROGRESS REPORT OF COMMITTEE ON MECHANICAL LOADING UNDERGROUND

I beg to submit the following report for the Committee on Mechanical Loading Underground for the current year. It was decided in November, 1920, by The American Mining Congress, to appoint a committee on loading machines for underground use. This committee was finally appointed and the organization completed by the first of the year. The work of the committee thus far has consisted in drafting a set of questionnaires to be sent to manufacturers and operators in order to determine the extent to which standardization of machines and fittings and standardization of methods of operation can be carried.

The first questionnaire, dealing with the standardization of parts of loading machines has been sent to various manufacturers; the second and third questionnaires, dealing respectively with mechanical loaders and with scrapers, have been sent to various operators with request for information as to methods of operation and results obtained. The returns from these questionnaires are incomplete, so that no report of results can be given at this time.

Signed by LUCIEN EATON, Chairman.

PROGRESS REPORT OF COMMITTEE ON MINE-FIRE FIGHTING EQUIPMENT

RESCUE APPARATUS

Mine rescue breathing apparatus is used primarily when it is necessary to penetrate dangerous atmospheres to save life, and also for the purpose of controlling underground fires. There are several types used in this country, as regards mechanism of construction, and the succeeding forms which have been made in recent years have resulted in types which have won the confidence of thousands of men who have been instructed to wear them. It is sufficient to state that rescue apparatus is now generally regarded as an essential part of a mine fire-fighting equipment.

The members of this committee are cognizant of the fact that very careful attention should be given to the selection of mine rescue apparatus, but no recommendation is offered suggesting the standardization of a particular type or types. It is agreed that an apparatus should not be used until it complies with the general requirements as recommended by the Bureau of Mines in Technical Paper 82, pages 23 and 24.

Apparatus are made in types to supply pure air to the wearer for a half-hour period and also for a two-hour period. The latter type is the kind principally used in mines for rescue and recovery

work, but both types are used in fighting underground mine fires. In deep mines, having openings extending considerable distance from outlets to surface, operators usually prefer to adopt the two-hour machine. There are mines in which fires have been sealed off and it has then been possible to operate the rest of the mine in safety. In instances of this kind, and others that may be cited, the half-hour type of apparatus may be used in preference in the larger and heavier type.

It is the concensus of opinion of the members of the committee that rescue apparatus meeting the Bureau of Mines' requirements, and providing the wearer with pure air for a two-hour period, is the most desirable machine, as a part of mine fire-fighting equipment.

Maintaining apparatus in first-class condition and thorough and systematic training of men are absolutely essential in order to insure its use with safety.

MECHANICAL RESUSCITATING DEVICES

There is always the possibility of lives being in danger when a fire originates in a mine, and a mine fire-fighting equipment is not complete unless there is utilized every laudable means to revive men who have become unconscious from inhaling smoke and gases caused by fire. The opinion of men in the medical profession, and also laymen as well, differ as to the value of mechanical resuscitation devices. Manual methods of resuscitation should be understood by fire fighters and the maintenance of the best types of mechanical resuscitation devices may not be objectionable, as a part of the equipment.

FIRE EXTINGUISHERS

The members of the committee suggest no preference relative to fire extinguishers but recommend that they be maintained at shaft stations, pump houses and other permanent underground locations where they will be accessible to quench fires in incipient stages. Frequent inspection must not be neglected.

FIRE HOSE

The committee suggests the advisability of standardizing on air hose, as pipe lines and air hose are always available for fighting fires, and to convert air lines to water lines is merely a matter of manipulating valves. A complete special water system for fire purposes from surface into underground openings is preferable in mines having a high fire hazard. Air hoses with drawn pipe nozzle in one end for this system should be kept at shaft stations, pump stations, etc.

FIRE PROTECTION AT COLLAR OF SHAFTS

The committee advise the maintenance of fire hose and hydrants close to the collar of shaft. In shafts carrying dry

timber a water spraying system is considered a very effective device. Steel head-frames and concrete shafts are the best security against fires.

BULKHEAD MATERIAL

Material for building bulkheads, such as posts, planks, sand, etc., should be kept stored underground, so that it can be utilized to advantage in localizing a fire by construction of bulkheads. Openings vary in size and no recommendations are offered on standardization.

PORTABLE BLOWERS

Due to lack of information relative to the advantage of using portable blows in fighting mine fires, the committee offers no suggestion.

STENCH SYSTEM OF ALARM

The committee offers no recommendations on this subject at this time.

Signed by WM. CONIBEAR, Chairman.

In the discussion which followed the reading of the report, it was suggested that a cement gun be included in the list of fire-fighting equipment, for building bulkheads.

The recommendation of the Committee that chemical fire extinguishers be installed underground, in shaft stations, met the approval of those present.

Written comments were received from Mr. Guy J. Johnson, Safety Inspector of the Homestake Mining Company, and Mr. Orr Woodburn, Director, Globe-Miami District Mine Rescue and First Aid Association, both members of this committee.

In regard to Resuscitation Devices, Mr. Johnson writes:

"As we recommended last year against mechanical resuscitation and in favor of manual methods, so I am still in favor of doing."

Mr. Woodburn, on the contrary, states:

"It would seem a very narrow policy to recommend the elimination of mechanical devices. The world over, men prominent in the medical profession and practically every hospital, are continuing to use mechanical devices and seem to favor them more every year."

In regard to Portable Blowers, Mr. Woodburn also states:

"The Butte District has pioneered the portable blower possibilities and can give the most authentic information. The Copper Queen Company at Bisbee, Arizona, has a disc type blower mounted on a truck and operated by storage battery on another truck. It was in use several years ago but cannot say what their conclusions were regarding its use. At present this district has but one blower for the exclusive use of fire-fighting and the electric cable reel for it has not been completed. The cable is with it and it can be used quickly. It is a 30 inch disc type with a one HP motor direct connected. The unit is mounted on a truck. To a plate around the housing, pieces of heavy canvas are fastened. These places overlap and have eyelets in the outer edges so that it is a simple matter to close a timbered drift around the fan. The fan is kept on the surface adjacent to a fire proof shaft. Many other small complete units are in and out of use constantly that are available for fire use and could be used on short notice any time."

DISCUSSION OF PROGRESS REPORT ON MINE FIRE-FIGHTING EQUIPMENT, BY THE GENERAL CHAIRMAN, CHAS. A. MITKE.

The use of the portable blower has been so extensive in mine fires in the Southwest that it has amply demonstrated its value as a necessary adjunct to fire fighting equipment. This type of blower was used successfully at the mine fires which occurred at the Lowell Mine of the Copper Queen branch of the Phelps Dodge Corporation, Bisbee, Arizona; the Clay and Coronado Mines of The Arizona Copper Company at Morenci and Metcalf, Arizona, and at the fires which occurred some years ago at the mines of the Cananea Consolidated Copper Company, in Sonora, Mexico. In some of the above instances, the fires were fought successfully without the use of helmets at all. Such a step, however, is not recommended for general practice. It is better to have helmets on hand and available in case of emergency. Where the portable blower is used, helmet crews are only needed for scouting, and to be kept in readiness in case any man should be overcome with gas while engaged in fighting the fire. There is a notable advantage in using portable blowers as a great deal of work, such as building bulkheads, timbering, drawing chutes where necessary, laying water lines, putting up electric light wires, etc., formerly done by men with helmets, is now performed by miners. They are able to work in the fresh air coming from the blowers and perform their tasks much more rapidly than men encumbered with the apparatus.

It was suggested at the Chicago meeting that a cement gun be included in the list of fire fighting equipment, for the purpose of building bulkheads. In this connection, Acting Chairman Daly mentioned the success attained with this apparatus in the mines in Butte. It has not, however, been very successful in the Southwest, mainly for the reason that where the fires have occurred it has been very much easier, and time has been saved, by building the bulkheads by hand, rather than to bring the cement gun equipment in from the outside, pass it through narrow drifts, and finally set it up in a convenient place. Moreover, the quantity of cement used on our bulkheads is so small that a very few sacks of cement and sand are sufficient. We rarely use more than a ⅜" to ¾" covering of cement on our bulkheads.

The character of bulkhead used in practically all cases in this part of the country is made in the following manner: First, stulls are put up; then 2" boards are nailed on the stulls; following this, metal lath, chicken wire, or wood lath, is nailed on the 2" boards; finally, from ⅜" to ¾" thickness of cement is put on by hand. Such bulkheads are easily and quickly constructed, have been used at some of our most serious mine fires, and have stood the test well, as regards gas pressure or leakage. The use of these bulkheads has been a very great factor in reducing the cost of fighting mine fires. In practically every case these bulkheads have been constructed by men working in fresh air from portable blowers, and without the use of oxygen helmets.

PROGRESS REPORT OF COMMITTEE ON DRILLING MACHINES AND DRILL STEEL

Following the meeting in Denver last year it was decided to form an inner committee to work on the standardization of rock drills. This committee is composed of the following members, the first named being chairman:

Arthur Notman, Supt., Copper Queen Branch, Phelps Dodge Corp., Bisbee, Ariz.

Chas. A. Smith, Supt., Ray Con. Copper Co., Ray, Ariz.

H. Seamon, Drill Efficiency Engineer, United Verde Copper Co., Jerome, Ariz.

Frank Ayer, Supt., Montezuma Copper Co., Nacozari, Sonora, Mexico.

L. C. Bayles, Chief Engineer, Ingersoll Rand Co., Phillipsburg, N. J.

Geo. A. Shaw, Efficiency Engineer, Denver Rock Drill Mfg. Co., Denver, Colo.

H. T. Walsh, Vice-Pres., Sullivan Machinery Co., Chicago, Ill.

Geo. Gilman, 125 Prescott St., E. Boston, Mass.

In making these appointments it was with the idea that the first four should act on behalf of the operators, while the latter four should represent the manufacturers. It was believed that in this manner the work of standardization could be advanced more expeditiously than by leaving the matter entirely in the hands of this committee. It was thought that the representatives of the rock drill companies would take the lead in these investigations, being naturally more familiar with the requirements of the trade, etc., and they immediately signified their willingness to so act by exchanging ideas and blue prints covering certain points under discussion. In submitting this report I shall quote quite freely from the opinions expressed by the members of this committee, the first being an extract from a letter of an official of one of the drill companies, who wrote:

"There is one thought that has occurred to us, and that is we should like to have this discussion on standardization confined to the prominent drill manufacturers. . . . In going over a tabulation of the air hose, water hose and tank connections of the different companies, there is a slight difference in practically all of them which at present defeats interchangeability. If we are going to get together on a general interchangeability, I feel that we must all be willing to give and take, and with such a procedure it is going to mean a certain amount of loss to all of us. . . . It will be an advantage in time for all the drill manufacturers to have interchangeability of connections, but it is going to represent not only money loss but a good deal of trouble to inaugurate. The drill manufacturers might get together and decide this matter of connections for themselves, but as we have expressed a desire to act in conjunction with your committee, I feel that it would facilitate matters if we could confer with you at the time of our joint meeting."

The first matter taken up by the different drill manufacturers was the question of a hose connection. As to what conclusions have been arrived at by them I am not advised, but anticipate that they will be submitted in a separate report. I have not met with this inner committee, as at first proposed, believing that it would be better to postpone such a conference until the meeting of The American Mining Congress, when it could be taken up as part of the routine work of this meeting.

A year ago certain questionnaires were sent to the different

mining companies, asking for information as to their drills, etc. These have been tabulated, as per the attached blueprint. I would like to call the attention of drill manufacturers to the fact that most of the larger mining companies are not using couplings manufactured by the rock drill concerns. I cannot help but think that the rock drill manufacturers should be able to get together on couplings, and I believe this also applies to other accessories of rock drills, such as the openings into water tanks in use with Leyner machines, etc. As I understand, no attempt has been made so far to standardize the size of bolts and nuts about the machines.

As to the advisability of trying to standardize the machines themselves, I shall quote from a letter from Mr. Ocha Potter, a member of my committee, as his views are representative of one branch of the correspondence which I have received:

"The question as to the standardization of drilling machines is, to my mind, a debatable one. Conditions in various lodes are so different that it hardly seems practicable to me to devise anything like a universal machine that would be satisfactory. Competition among drilling machine manufacturers is so keen that the larger mining companies, at least, are at present able to get anything that they think desirable in the way of drilling machine equipment. In our own case, we find that machines that are adaptable to our conglomerate, which is very hard and fitchery, are not at all suitable to our amygdaloid mines, which are just the opposite in character.

"You will note from the figures inclosed that the change in gauge on the amygdaloid is only 1/32 of an inch for a 22" drill steel run, whereas on the conglomerate there is a change of 1/16 of an inch for each 9" drill steel run. As a matter of fact, we have had a drilling machine in operation for over six months on our amygdaloid, drilling holes up to 15 ft. in depth, with no change whatever in gauge. Such practice on the conglomerate, however, would be absolutely impossible.

"As far as possible, this Company has already standardized its drilling machine practice, and the machine now used for any particular operation is the one that has been found most economical for that particular purpose. There are, however, mines in this same district whose conditions are such that our drilling machine practice would be impracticable for them. So far as the mines in the Iron Country are concerned, judging from my own personal observations only, I am confident that their conditions justify a still different type of machine."

Along the same lines Mr. H. Seamon, another member of my committee, says:

"Subjects such as the advisability of a lighter drill, etc., are properly included, but the greatest field seems to be in the standardization of accessory equipment."

Referring to the blueprint summarization of questionnaires, it will be noted that there is a wide diversity of opinion on some matters. Question 1 shows a majority in favor of standardizing the water drill only. In Question 2, as to the size of the drill bar, one-half of the members do not believe it is possible to standardize the size of the bar, while those who do vary in their opinions from 3" to 3¼". In No. 3 the type of drifting machine is almost standardized as the water leyner type. No. 5 shows

the stoping machines to be nearly all stope hammers, and most of the members think that the wet stoping drill is only a matter of time. In No. 7 the jackhammer type is used almost entirely for plugging. In No. 12 it appears that the spray for stoper drills is considered non-effective, and is unpopular with the men. As to the ideal weight of machines opinions vary greatly, as shown by Question 15, varying from 45 to 165 lbs. It is not necessary, however, to discuss each questionnaire here, as an inspection of the blueprint will disclose the various opinions. I wish to state in passing that I believe such sheets, if carefully prepared from time to time, would be of value to the mining industry and would tend to standardize the work of drilling, as they plainly show the practice of the different companies, and any advance noted thereon would soon be adopted by other companies. It must be realized that before standardization can take place a demand for it must be created among the mining companies themselves, and anything we can do to bring this about will be of vital assistance.

DRILL STEEL

Coming now to the question of drill steel, it will be noted in the questionnaires submitted that 1¼" hollow round steel is used by most of the mining companies for drifting, with but one company using hollow 1¼" octagon and another 1" and ⅞" hollow hexagonal steel. Question 23 on stoping shows that a variety of steel is used, with a tendency toward wet machines using ¼" octagon, while the jackhammers use ⅞" hollow hexagonal almost exclusively. It would thus appear that the companies are very close to a standard on steel already, and the question of the size of the hole is the debatable point among the operators.

The committee has had a paper from Mr. Charles S. Hurter, of the Du Pont Company, on "The Effect of Cartridge Diameter on the Strength and Quickness of High Explosives," which I consider of such importance that I recommend its publication in full herein.

Our own experience at the North Butte mines is in line with the work of Mr. Hurter, this company having done a great deal of experimentation on rock drill rounds. We have found that in drifts and crosscuts the 1¼" powder gives the best results, though in stoping where we have two faces to break to we have gone to ⅞". In this connection I quote Mr. L. C. Bayles of the Ingersoll-Rand Company, as follows:

"If it cost nothing to drill a hole, then one would only to have to consider the most desirable size from the standpoint of the explosive. But the cost of a hole advances about as the square of the diameter, and the point is soon reached when the increased cost becomes more than the increased efficiency of the explosive. It takes more steel to form large bits and it takes the blacksmith longer to resharpen them.

(True, this is not much, but nevertheless it amounts to something.) Then it takes the miner longer to drill the larger holes."

There is one point in Mr. Bayles' statement which I think should be a little more explicit, and that is whether he means the cost of just the time the drill is running, or whether he has allowed for the idle time which a machine is usually run in drilling operations. Our own experience shows that a drill is in actual operation not more than two hours out of eight hours during a shift, and that the rest of the time is spent in loosening and tightening bolts, changing drill steel, etc. Allowing for this time would, of course, bring the cost of the whole below the square of the diameter. Several companies report experiences along the lines suggested by Mr. Hurter, and I quote from Mr. Arthur B. Foote of the North Star Mines Co.:

"The North Star mine is all in hard rock so that drilling and blasting are the two largest factors in the cost of mining. During experiments, with the object of increasing the speed of drilling, an attempt to attain increased speed was made by reducing the diameter of the drill bits to such an extent that it was necessary to use 7/8" diameter powder in the bottoms of the holes. It was found that it was impossible to break the ground satisfactorily with this size powder."

And in this connection also Mr. George A. Shaw of the Denver Rock Drill Mfg. Co. states:

"While we have never been able to conduct any experiments on the proper size to which a hole should be drilled, we have been able to note the average trend of bit sizes through the equipment ordered for drill sharpeners. While there was a tendency a few years ago to reduce the size of the hole drilled to a minimum, this practice seems to have greatly lost favor and I think there are very few bits made at the present time smaller than 1¼" or 1⅜" for deep holes. This would not apply, of course, to short holes for block-holeing and possibly to a great deal of stoper work for raising, etc."

It is apparent from the above reports that most of the mining companies will use either 1⅛" or 1¼" powder in a large part of their work. However, the question of standardizing the number and sizes of drills and drill bits will vary with each mining camp, owing to the nature of the ground encountered. I think this difference is shown in Question 22, and I do not believe that the "whims" of mining superintendents are accountable for it. In some cases the starting size varies from 1⅞" to 2½", and I believe a great many of these sizes have been determined by actual practice, and represent the best results obtained. Mr. Chas. A. Smith of our committee did not find his experiments with a small sized starter satisfactory, and states:

"We have done some experimenting with the Carr Bit in the effort to reduce the size of the hole at the collar, but our efforts have not been very successful. We seem to get better results by using larger steps between the bits and making the holes correspondingly larger at the collars."

At the North Butte properties an endeavor has been made to

SUMMARIES

SUBS

UNITED STATES MINING COMPANY.
ARIZONA COPPER COPPER COMPANY
CALUMET & HECLA COPPER COMPANY.
OLD DOMINION COPPER COMPANY.

1	SCOPE. SHALL IT INCLUDE P DRILL WITHOUT WATER ATTA OR WATER DRILL ONLY. ?	WATER DRILL ONLY	BOTH	WATER DRILL ONLY
2	IS IT POSSIBLE TO DECIDE DEFINITE SIZED BAR FOR I DRILLING ?	3" OR 3½" BAR	3" BAR	NO
3	WHAT TYPES OF DRIFTING MAC ARE USED IN YOUR MINE OR	WATER LEYNER	WATER LEYNER	WATER LEYNER
4	HOW MANY OF EACH TYPE	35	24	24

SUMMARY QUESTIONNAIRES

SUBMITTED TO THE FOLLOWING MINING COMPANIES

UNITED STATES REFINING & MINING CO. NORTH BUTTE MINING CO. IRON CAP COPPER MINING COMPANY.
ARIZONA COPPER CO. LTD IDAHO-MARYLAND MINES CO. INSPIRATION CONSOLIDATED COPPER COMPANY
CALUMET & HECLA MINING CO. UNITED VERDE EXTENSION. RAY CONSOLIDATED COPPER COMPANY.
OLD DOMINION CO. NORTH STAR MINES CO. UNITED VERDE COPPER MINING COMPANY.

1 SCOPE SHALL IT INCLUDE PRESENT DRILL WITHOUT WATER ATTACHMENT OR WATER DRILL ONLY ?	WATER DRILL ONLY		BOTH	WATER DRILL ONLY	WATER DRILL ONLY	BOTH	WATER DRILL ONLY		WATER DRILL ONLY	WATER DRILL ONLY	BOTH	WATER DRILL ONLY
2 IS IT POSSIBLE TO DECIDE ON A DEFINITE SIZED BAR FOR USE IN DRILLING ?	NO	YES	3½" BAR	NO	NO	NO	3" BAR		NO	3" OR 3½" BAR	3" BAR	NO
3 WHAT TYPES OF DRIFTING MACHINES ARE USED IN YOUR MINE OR MINES ?	WATER LEYNER	WATER LEYNER	WATER LEYNER	WATER LEYNER & JACKHAMMER	WATER LEYNER	WATER LEYNER	WATER LEYNER	WATER LEYNER PISTON	WATER LEYNER	WATER LEYNER	WATER LEYNER	WATER LEYNER
4 HOW MANY OF EACH TYPE ?	76	20	22	27 – 4	6	37	55	255 – 70	50	35	31	24
5 WHAT TYPES OF STOPING MACHINES ARE USED IN YOUR MINE OR MINES ?	STOPE HAMMERS	STOPE HAMMERS	DRY STOPERS	DRY STOPERS	WET STOPERS	WATER LEYNER DRY STOPERS	DRY STOPERS	WATER LEYNER & PISTON	STOPE HAMMER	STOPE HAMMER	DRY STOPE HAMMERS	WATER LEYNER & PISTON
6 HOW MANY OF EACH TYPE ?	177	15	44	12	3	77	34	255 – 70	179	33	27	64 – 57
7 WHAT TYPE OF JACK-HAMMER IS USED IN YOUR MINE OR MINES ?	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER	JACKHAMMER
8 HOW MANY OF EACH KIND ?	56	25	10	19	5	37	31	38	130	83	2	107
9 HOW MANY JACKHAMMERS ARE MOUNTED ? UNMOUNTED ?	NONE 56	NONE 25	NONE 10	10 MOUNTED 19 UNMOUNTED	NONE	12 MOUNTED 25 UNMOUNTED	2 MOUNTED 29 UNMOUNTED	38 UNMOUNTED	130 UNMOUNTED	ALL UNMOUNTED	ALL UNMOUNTED	107 UNMOUNTED
10 HOW MANY WET STOPERS IN USE ? HOW MANY DRY ?	2 WET 177 DRY	NONE 25 DRY	16 WET 28 DRY	NONE 36 DRY	2 WET 1 DRY	DRY	4 WET 30 DRY		ALL DRY	7 WET 50 DRY	ALL DRY	ALL WET
11 HOW MANY JACK-HAMMERS ARE USED WET ? HOW MANY DRY ?	NONE 56 DRY	8 WET 17 DRY	NONE 10 DRY	ALL WET	ALL WET	DRY	2 WET 29 DRY	16 WET 22 DRY	DRY	ALL WET	DRY	ALL WET
12 HOW MANY DRY STOPERS ARE PROVIDED WITH SPRAYS TO LAY THE DUST ?	NONE	NONE	NONE	NONE - UNPOPULAR	NONE	ALL EQUIPPED WITH SPRAYS	NONE	NONE	NONE	SPRAYS USED IN DUSTY PLACES	NONE	NONE
13 HOW MANY JACK-HAMMERS ARE PROVIDED WITH SPRAYS TO LAY THE DUST ?	NONE	NONE	NONE	ALL WET	NONE	ALL WET	NONE	NONE	NONE	ALL WET	NONE	NONE
14 WHAT IN YOUR OPINION IS THE IDEAL WEIGHT OF MACHINE FOR APPROXIMATELY 90% OF THE GROUND IN YOUR MINE FOR DRIFTING ?	160 TO 170 POUNDS	148 POUNDS	148 POUNDS	148 POUNDS		90 TO 120 POUNDS	150 POUNDS		148 POUNDS	85 TO 88 LBS	125 POUNDS	150 TO 165 POUNDS
15 WHAT IN YOUR OPINION IS THE IDEAL WEIGHT OF MACHINE FOR STOPING IN YOUR GROUND ?	70 TO 80 POUNDS	61 POUNDS	61 POUNDS	45 POUNDS		65 POUNDS	75 TO 80 POUNDS		80 TO 85 POUNDS	85 TO 88 LBS.	125 POUNDS	150 TO 165 POUNDS
16 WHAT IN YOUR OPINION WOULD BE THE IDEAL WEIGHT OF JACK-HAMMER IN YOUR GROUND ?	50 TO 55 POUNDS	47 POUNDS	47 POUNDS	45 POUNDS		21 POUNDS	30 TO 40 POUNDS		35 TO 40 POUNDS	85 TO 88 LBS	60 POUNDS	40 POUNDS
17 WHAT IN YOUR OPINION IS THE POSSIBILITY OF BUILDING A MACHINE OF MEDIUM WEIGHT TO TAKE THE PLACE OF BOTH YOUR DRIFTING MACHINES AND JACK-H	NOT POSSIBLE	NOT POSSIBLE	NOT POSSIBLE	YES. BELIEVES A LIGHTER STOPER CAN BE BUILT		NOT POSSIBLE	NOT POSSIBLE		NOT POSSIBLE	YES IT IS POSSIBLE	NOT POSSIBLE	NOT POSSIBLE
18 WHAT WEIGHT WOULD YOU SUGGEST FOR SUCH A MACHINE ?				45 POUNDS	50 POUNDS					85 TO 88 LBS.	125 POUNDS	
19 HAVE ANY EXPERIMENTS BEEN CONDUCTED BY YOUR COMPANY IN STANDARDIZING UPON ONE MACHINE FOR DRIFTING AND PLUGGING ?	NONE	NONE	NONE	YES	INTENDS EXPERIMENTING	YES	YES		YES	NONE	NONE	NONE
STEEL												
20 WHAT KIND OF LEYNER STEEL DO YOU USE ? HOLLOW ROUND, 1/4 OCTAGON, HOLLOW SQUARE (% OF EACH)	HOLLOW ROUND	HOLLOW ROUND	HOLLOW ROUND	HOLLOW ROUND	HOLLOW ROUND	HOLLOW ROUND	HOLLOW ROUND	75% HOLLOW HEX. 25%	HOLLOW ROUND	HOLLOW ROUND	1/4 OCTAGON	HOLLOW ROUND
21 WHAT IS THE DIAMETER OF THE STEEL USED ?	1¼"	1⅛"	1¼"	1¼"	1¼"	1⅛"	1¼"	1" ⅞"	1⅛"	1¼"	1"	1¼"
22 WHAT IS THE DIAMETER OF BIT STARTER ? SECOND STEEL	2"	2½"	2"	2"	2⅜"	1⅞"	2¼"	1⅞" 1⅜"	2¼"	2¼"	1⅞"	1¹³⁄₁₆"
" " " " THIRD "	1⅞"	2⅜"	1⅞"	1¹⁵⁄₁₆"	2 3⁄16"	1¹³⁄₁₆"	2⅛"	1¹³⁄₁₆" 1¹¹⁄₃₂	2"	2"	1¾"	1⅜" 1⅜"
" " " " FOURTH "	1¾"	2¼"	1¾"	1⅞"	2"	1¾"	2"	1¾" 1⅛"	1⅞"	1⅞"	1½"	1¾" 1½"
" " " " FIFTH "	1⅝"	2⅛"	1⅝"	1¹³⁄₁₆"	1¾"	1⅛"	1⅞"	1¹⁵⁄₁₆" 1¾"	1¾"	1¾"	1⅜"	1¾" 1⅜"
" " " " SIXTH "	1½"	2"	1½"	1¾"	1½"	1⅜"	1⅝"	1⅝" 1¼"	1⅝"	1⅝"		1⁹⁄₁₆" 1⅞"
	1⅜"	1⅞"	1⅜"	1¹¹⁄₁₆"		1⅝"	1¾"			1½"		
						1⅝"	1½"					
23 WHAT KIND OF STOPER STEEL IS USED ? % OF EACH CRUCIFORM SOLID, HOLLOW 1/4 OCTAGON SQUARE HOLLOW	CRUCIFORM 1/4 HOLLOW OCTAGON	CRUCIFORM	CRUCIFORM 1/4 HOLLOW OCTAGON	CRUCIFORM SOLID	HOLLOW HEXAGON	CRUCIFORM SOLID	1/4 OCTAGON 10% HOLLOW 90% SOLID	1" ⅞" HOLLOW HEXAGON	CRUCI 1/4 OCT 25% 75%	CRUCIFORM 1/2 OCT.	1/4 OCTAGON	1/4 OCTAGON.
24 WHAT IS THE DIAMETER OF STEEL USED ?	1⅜" ⅞"	1⅛" 1¼"	1" ⅞"	1"	1"	1"	1"	1" ⅞"	1"	1" ⅞"	1"	⅞"
25 WHAT IS THE DIAMETER OF DRILL BIT STARTER ? DIAMETER OF SECOND STEEL	2"	2¼"	1¾"	1⁹⁄₁₆"	2⅜"	1⅝"	2"	1⅞" 1⅜"	2½"	1¾"	1⅞"	1⁵⁄₁₆" 1⅛"
" " " THIRD "	1⅞"	2"	½ DECREASE ON 5 STEELS	1½"	2 3⁄16"	1⁹⁄₁₆"	1⅞"	1¹³⁄₁₆" 1¹¹⁄₁₆	2"	1⅝"	1¾"	1⅛" 1⅜"
" " " FOURTH "	1¾"	1½"	1⁄16" ON 6TH	1⁷⁄₁₆"	2"	1½"	1¾"	1⅜" 1⅝"	1⅞"	1½"	1½"	1¾" 1⅜"
" " " FIFTH "	1⅝"			1⅜"	1¾"	1⁷⁄₁₆"	1½"	1⅝" 1¾"	1¾"	1⅜"	1¼"	1⅜" 1⅝"
" " " SIXTH "	1⅜"			1⅝"	1½"	1⅜"	1⅜"	1⅝" 1¼"	1⅝"	1¼"	1⅜"	1⅝" 1¼"
				1¼"		1⁵⁄₁₆"	1⅝"					
26 WHAT KIND OF JACK-HAMMER STEEL DO YOU USE ? HOLLOW HEXAGON, SOLID HEXAGON, % OF EACH	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	HOLLOW HEXAGON	1/4 OCTAGON
27 WHAT IS THE DIAMETER OF THE JACK-HAMMER STEEL USED ?	⅞"	⅞"	⅞"	⅞"	1"	⅞"	⅞"	⅞"	⅞"	⅞"	⅞"	⅞"
28 WHAT IS THE DIAMETER OF DRILL BIT STARTER ? DIAMETER OF SECOND STEEL	2"	1½" ONLY	1¾" 1/8 GAUGE	1⁹⁄₁₆"	2"	1⅞"	2"	1⅜"	1⅞"	1¾"	1⅞"	1⁵⁄₁₆" 1⅛"
" " " THIRD "	1⅞"			1½"	1¾"	1¾"	1⅛"	1¼"	1¾"	1⅝"	1¾"	1⅜" 1½"
" " " FOURTH "	1¾"			1⁷⁄₁₆"	1⅝"	1⅝"	1¾"	1⅝"	1⅝"	1¾"	1⅝"	1⅞" 1⅜"
" " " FIFTH "	1⅝"			1⅜"	1½"	1½"	1⅝"	1¾"	1¾"	1⅜"	1½"	1¹¹⁄₁₆" 1⅝"
" " " SIXTH "	1½"			1⅝"		1⅜"	1½"		1½"	1¼"	1⅜"	1⅝" 1¼"
	1⅜"			1¼"		1¼"	1⅜"		1⅜"			
DRILL BITS												
29 WHAT MAKES OF AIR AND WATER HOSE DO YOU USE ?	SPLY MALTESE AIR MALTESE WATER	INGERSOLL-RAND HOSE	PEERLESS	REPUBLIC RUBBER CO.	MONTEREY	VARIOUS	50% BRAIDOMATIC 50% 3" NON-KINK	VARIOUS	DIAMOND 5" AIR DIAMOND 4" WATER	VARIOUS	VARIOUS - NOT WIRE WOUND	QUAKER CITY & U.S. RUBBER
30 WHAT IS THE DIAMETER OF EACH ?	AIR ¾" WATER ½"	AIR 1" WATER ½"	AIR ¾" WATER ½"	AIR ¾" WATER ½"	AIR 1"	AIR ¾" WATER ½"	AIR ¾" WATER ½"	AIR 1" WATER ½"	AIR ¾" WATER ½"	AIR ¾" WATER ½"	AIR 1" WATER ½"	AIR ¾" WATER ½"
31 WHAT TYPE OF CONNECTIONS DO YOU USE ?	MULCONROY	LUNKENHEIMER			JEFFERSON	LUNKENHEIMER	INGERSOLL-RAND 32		NO MAKE. NUT SLEEVE & CLAMP	SARGEANT. INGERSOLL-RAND	JEFFERSON GASKETLESS	NONE. WIRE WOUND
32 WHAT CONNECTIONS HAVE YOU FOUND MOST SATISFACTORY ?	MULCONROY	LUNKENHEIMER	CLEVELAND UNIVERSAL	CLEVELAND	JEFFERSON	LUNKENHEIMER	INGERSOLL RAND		SHOULD STANDARDIZE FOR EACH MINE	SATISFACTORY	SATISFACTORY	LUNKENHEIMER.
33 WHAT WOULD YOU SUGGEST AS A STANDARD UNIVERSAL COUPLING BETWEEN HOSE AND MACHINE ?	NO RECCOMENDATION.	LUNKENHEIMER	CLEVELAND UNIVERSAL	CLEVELAND	JEFFERSON		SATISFACTORY		SPUD WITH INLET SCREEN	SATISFACTORY	STANDARD PIPE THREAD	MR GILMAN'S SUGGESTION IN ENG & MINING JOURNAL
34 AS THE PRESENT TEND SEEMS TO BE TOWARD THE WATER DRILL, WOULD IT BE ADVISABLE TO TRY TO STANDARDIZE THE MACHINES THAT ARE NOW IN USE IN DRY DRILLING, IN VIEW OF THE PATTERNS, SUPPLIES, ETC THAT THE MANUFACTUERS HAVE ON HAND ?	NO	NO	YES	NO	NO	NO	YES		NO	NO	NO EXCEPT HOSE CONNECTION.	NO

use standard rounds in the drifts and crosscuts, as well as in stoping. In making these rounds the ground has been classified into five divisions: Extremely Hard, Hard, Short, Medium and Soft. The selection of the card to be used depends upon the judgment of the shift boss. Attempts were made to find some method of classifying the ground by tests of hardness, but so far we have found no method of determining the breaking quality of different grounds. Numerous tests have been suggested, but do not work in actual practice. Until some such standards are discovered the question of breaking ground at the mine will always remain in the hands of the foreman and be a matter of experimentation. It is evident that once they are worked out for any mine, they can then be followed indefinitely.

In conclusion, "Standardization" may be said to be the "establishing of any type, model or measure by general usage and consent." On such points, therefore, as the members of this committee have reached a practical agreement, standardization may be said to be nearing realization, while as to those showing views far apart further discussion is recommended.

Signed by N. B. BRALY, Chairman.

UNIVERSITY OF ILLINOIS LIBRARY

THE EFFECT OF CARTRIDGE DIAMETER ON THE STRENGTH AND QUICKNESS OF HIGH EXPLOSIVES

By CHAS. S. HURTER

As one of the explosives members of the committee on Drills and Drill Steel and as a representative of an explosives company, the writer, in common with practically all fellow members of the explosives business does not look with favor on any change in drills that will lead directly or tend to lead to a reduction in the diameter of the high explosives cartridges in common use. The manufacture of small diameter cartridges is more expensive than the manufacture of the larger diameters, and according to the research results we have at hand—incomplete, it is true—the use of small diameter cartridges is uneconomical for the consumer because they do not develop the full explosive strength of the dynamite used.

In the days before the stoping drills and other hammer drills were invented, 7/8"x8" cartridges were used in hand-drilled holes, nitroglycerin dynamite was the general rule, holes were rarely over three feet deep, and little or no trouble was ever experienced in blasting. At the present time machine drills, particularly those of the hammer type, have made is possible to drill much deeper holes and ammonia dynamite and gelatin, which have many superior features but are both more insensitive than nitroglycerin dynamite, have almost completely replaced the latter in underground work. Under these conditions the diameter of the cartridge has become an important factor in determining the execution to be secured from a given weight of explosive.

It is my purpose to set before you here some evidence which shows that the detonation wave, whose characteristics closely resemble those of a sound wave, is transmitted more freely, with greater strength and violence, that is, as the cartridge or charge diameter increases up to certain limits, these depending upon the natural sensitiveness of the explosive in question. And in passing let me say that fifteen years' experience in the practical use of explosives has proved to my personal satisfaction that cartridge and charge diameter should be as close to the same as is practical; that is, that better results are obtained from a blast when cartridges are used that fit the bore hole fairly closely than when smaller cartridges are mashed up with a tamping stick in the bore-hole in an attempt to fill it.

Probably no man ever lived who did more work on explosives from the standpoint of scientific research than the late P. E. M. Berthelot, the famous French chemist. To him we are indebted

for most of our information in regard to the nature of the detonation reaction, its means of starting and propagating and its other characteristics. In the course of his researches he discovered that under adverse conditions, an explosive can detonate in a manner that does not give its maximum strength and shattering effect, and conversely, two facts that have a most important bearing on the question in hand: First, that in a given explosive, the maximum strength or explosive effect is obtained or the detonation is most complete, under conditions when the explosive detonates with the greatest violence, that is with the greatest quickness; and second, that the smallest quantity of deleterious fumes are given off by any explosive when the detonation is most complete.

Now, just as maximum strength is coincident with quickness of detonation, so quickness of detonation, in a given explosive, has a direct relation to its sensitiveness. Consequently tests of the sensitiveness of dynamite in cartridges of various sizes give some indication of the effect of diameter upon quickness and upon strength. The standard sensitiveness test consists in cutting a cartridge in halves, priming one half with a No. 6 blasting cap, rolling the two halves, with the cut ends facing each other, in a sheet of the same paper as is used to line dynamite cases to form a tube of three thicknesses of paper, lighting the fuse, exploding the unprimed half by propagation and repeating the experiment with increasing distance between the half cartridges until it has been ascertained what the maximum distance is at which the primed half will explode the other half.

The following results of sensitiveness tests were taken at random from the experimental files of the Eastern laboratory of E. I. Du Pont de Nemours & Co.

By Chas. S. Hurter

Grade	Size	Temp. F.	Sensitiveness
60% Low-freezing Ammonia	1¼"x8"	70	20"
60% Low-freezing Ammonia	⅞"x8"	70	8"
60% Low-freezing Ammonia	1¼"x8"	0	7"
60% Low-freezing Ammonia	⅞"x8"	0	0"
40% Low-freezing Ammonia	1¼"x8"	70	12"
40% Low-freezing Ammonia	⅞"x8"	70	5"
40% Low-freezing Ammonia	1¼"x8"	0	3"
40% Low-freezing Ammonia	⅞"x8"	0	0"
*62% Gelignite (75% Gelatin)	1¼"x8"	70	18"
*62% Gelignite (75% Gelatin)	⅞"x8"	70	12"
* Blasting Gelatin	1¼"x8"	70	11"
* Blasting Gelatin	⅞"x8"	70	6"

They show the propagation distance to be in every case greater with the larger diameter cartridge. They also show the effect of chilling on the two sizes, namely, that it produces greater insensitiveness in the smaller sizes.

* Average of 10 mixings each.

In general with cartridges of the same size, the greater the propagation distance, the greater is the sensitiveness of the dynamite. In comparing cartridges of different sizes, however, another element which enters into the reaction must be taken into consideration. The large quantity of explosive in the larger diameter cartridges tends in itself to increase the distance at which propagation will take place. It has been established by **Berthelot that the distance over which shock is effective varies directly as the quantity of initial explosive, and that the intensity of the shock transmitted varies inversely as the square of this distance.

Therefore we cannot take the propagation distance alone as a measure of sensitiveness and strength but must consider in conjunction with it the velocity of detonation or quickness of the dynamite. Here follow the results of some tests made by the Hercules Powder Company.

Grade 20% Straight Nitroglycerin Dynamite

Diameter of Cartridge	Velocity of Detonation
⅞"	7500 ft. per second
1"	7800 ft. per second
1¼"	8380 ft. per second
1½"	8880 ft. per second

Grade 30% Low-Freezing Ammonia Dynamite

⅞"	7200 ft. per second
1"	7500 ft. per second
1¼"	9500 ft. per second
1½"	10250 ft. per second

These figures show that the velocity of nitroglycerin and ammonia dynamite increases steadily with increasing diameter.

I do not lose sight of the fact that gelatin is the explosive most widely used in metal mines, but laboratory tests of gelatin are very unsatisfactory as it has a totally different action when shot unconfined than when it is properly confined in a bore-hole. When confined, gelatin has from two and one-half to three and one-half times the quickness or smashing effect, according to the strength used, than it has when unconfined. The following table gives the results of some velocity tests made with Du Pont low-freezing straight gelatin and this is about the only experimental data available on gelatin. These tests were made unconfined in the open air.

**See Berthelot "Explosives and their Power," Chapter "Explosives by Influence"; also "Lake Superior Mining Institute Transactions," 1917, article on "Blasting Explosives and their Accessories."

Grade	40% DuPont			60% Du Pont		
Size of Cartridge	7/8"x8"	1¼"x8"	1½"x8"	7/8"x8"	1¼"x8"	1½"x8"
Density	1.68	1.72	1.69	1.61	1.80	1.636
Velocity—1st cartridge Ft. per second	7376	7777	8475	8636	8944	8803
Velocity—2nd cartridge * Ft. per second	7724	8013	8817	8495	9407	10810

These figures go to show that the action of gelatin is more violent and more complete with large diameter cartridges than with small.

On this subject of cartridge diameter as affecting sensitiveness and velocity the Bureau of Mines wrote us as follows:

"In general it is believed that explosives of the same class, grade and density have a lower rate of detonation and are less sensitive to the propagation of the explosive wave as the diameter of the cartridge decreases. Tests by the Bureau confirm this. Tests made on Grade 11 TNT by the Bureau confirm the statement regarding sensitiveness. Many tests by the Bureau confirm the statement regarding rate of detonation."

From all this evidence it seems clear that the quickness and sensitiveness of dynamite, and consequently its strength, increase with the diameter of the cartridge, in short, that the explosive reaction is more complete and approaches closer to the calculated theoretical reaction in large diameter bore-holes than in small ones. This conclusion must be qualified, however, as provided for at the outset, by the knowledge that strength and quickness increase with increasing diameter only up to certain limits. The only research work that has been done to ascertain what these limits are is that of Berthelot on just one explosive, namely, the European dynamite No. 1, which is made up of 75% nitroglycerin and 25% kisselguhr. While the incombustible absorbent renders this dynamite no stronger than the American 40% explosives, its nitroglycerin content makes it one of the most sensitive explosives in use. Berthelot's tests showed that the maximum diameter above which no increase in sensitiveness was observed was about 1¾ inches. In the case of the more insensitive explosives, we know that the cartridge diameter corresponding to the greatest efficiency is considerably greater than this. With some of the extremely insensitive high explosives used in the recent war, it is 4 inches and even more.

On yet another ground, as previously suggested, the larger diameter cartridge has greater strength than the smaller; that paper and paraffin in the wrapper. For instance, a 50-lb. case is, it contains more explosive in proportion to the amount of

* In making velocity tests the full speed of detonation is not always obtained in the first cartridge of the line.

of 1¼"x8" low-freezing ammonia dynamite contains about 46.9 lbs. of explosive and 3.1 lbs. of paper and paraffin, while the same case of ⅞"x8" contains approximately 45.2 lbs. of explosive and 4.8 lbs. of paper and paraffin. In this connection it is well to note also that, disregarding paper, only half as much powder can be put into a bore-hole one inch in diameter as can be loaded in a hole one and one-half inches in diameter, the lengths of the charges being equal. The ratio is even less than this when the weight of the paper and paraffin is considered.

Returning to the second fact quoted earlier in this paper as established by Berthelot in regard to the detonation reaction, namely, that the smallest amount of deleterious fumes are given off when the detonation is most complete, we can now deduce from the data which has been set forth above that, inasmuch as the greater sensitiveness and quickness of the larger diameter cartridges causes them to detonate more completely than the smaller ones, they will give off a lesser quantity of harmful fumes. In addition to the less complete detonation of the small sizes, there is another cause which makes them produce a greater quantity of fumes than the larger sizes, namely, the larger ratio of paper and paraffin to powder in them. The oxygen balance is lower and hence the proportion of noxious gas, carbon monoxide after detonation is higher. In close work this is very noticeable. This defect of the smaller sizes might be corrected to a certain extent in some kinds of dynamite by changing the formula, but gelatin dynamite cannot be changed without reducing its efficiency. Consequently in badly ventilated or close places, the larger cartridges will mean better breathing conditions for the men.

Certain other factors which affect the quickness and strength of dynamite have also a direct connection with cartridge diameter, such as water-resistance, density, and suspectibility to freezing. Information on these properties has been secured direct from the records of the Eastern laboratory of E. I. Du Pont de Nemours & Co. The following results of some experiments made there go to show that water-resistance is a function of the size of the cartridge inasmuch as the smaller the diameter, the sooner will water penetrate the entire cartridge. Each line in the table below represents an experimental mixing of low-freezing ammonia dynamite, half of which was punched in 1¼"x8" cartridges and other half in ⅞"x8".

Percent Strength	Hours Immersed under Water	Hydrostatic Pressure in lbs. per sq. inch	RESULT ⅞"x8" D	⅞"x8" P	⅞"x8" F	1¼"x8" D	1¼"x8" P	1¼"x8" F
60	1	15	2	3	0	5	0	0
60	1	15	0	4	1	5	0	0
60	½	15	2	3	0	4	1	0
60	½	15	4	1	0	5	0	0
40	½	15	1	2	2	3	2	0
40	½	15	1	3	1	3	1	1

D—Detonation. P—Partial Detonation. F—Failure to Detonate.

The density of a dynamite also varies with the size of the cartridge. At the present time practically all dynamite is machine packed and the construction of the packing machines is such that the powder is always loaded to a higher density in small diameter cartridges than in the larger ones. Now, other things being equal, a high density is conducive to more rapid deterioration from leakiness and setting. It also tends to make the powder more susceptible to becoming insensitive through being chilled. The number of 7/8" diameter cartridges to the 50-lb. case is about 2½ per cent less than the number based on 1¼" diameter cartridges figured by the mathematical rule that the area of a circle varies as the square of the diameter.

The Eastern Laboratory has no data to illustrate that small diameter cartridges will freeze more rapidly than larger sizes but this is probably the case. At least the fact that the former are punched to higher densities than the latter means that they are a better conductor of heat or cold and this in itself is conducive to more rapid freezing and thawing. The less time necessary for a small diameter cartridge to chill through is a self-evident fact.

The manufacture of small diameter cartridges is, as was said in the beginning, more expensive than that of the larger sizes and this fact has some slight effect on the price of all sizes, for in calculating the production cost of any given size, the average packing cost for all sizes is used. Therefore if the proportion of 7/8"x8" and 1"x8" cartridges used becomes very large, it will cause a corresponding increase in prices to cover the higher average packing cost, whereas, if the general consumption of larger cartridges increases, it will correspondingly lower the average packing cost and hence the price.

In summation it may be said, then, that small diameter cartridges are more apt to give trouble than the larger sizes because of their lower sensitiveness, their greater loss of sensitiveness when chilled, their more rapid chilling or freezing and their poorer water resistance. At their best they introduce greater chances of failure to propagate, and this is important in actual work for fragments of rock or dirt frequently get between cartridges as they are loaded in a borehole which tend to decrease the intensity of the explosive wave and reduce the violence and strength of the explosive reaction. The explosive tests are naturally increased by anything that tends to prevent the full explosive force from being exerted. In the comparatively deep holes drilled by stoping drills, for example, it is often necessary at present to use a 60% explosive in the bottom in 7/8"x8" cartridges with, let us say, a 40% explosive in 1⅛"x8" cartridges farther out in the hole to complete the charge. The 60% dynamite in the small diameter cartridge is not giving its full explosive force. If the hole were large enough to accomodate

a 1⅛"x8" cartridge at the bottom, there would be two gains: first, the larger borehole would hold a greater quantity of explosive, and second, the explosive force of a 40% dynamite in the 1⅛"x8" cartridge would be fairly close to that of a 60% dynamite in a ⅞"x8" cartridge. Particularly is this true of the gelatin dynamite which is almost exclusively used in stoper drill holes.

For all these reasons and on the basis of wide investigation of results of using high explosives in small diameter cartridges the explosives companies are agreed in their recommendation that in holes over three feet deep it is best not to use cartridges having a diameter of less than 1⅛". In the West 1⅛"x8" is the standard size; in the East 1¼"x8".

STANDARDIZATION OF DRILLING MACHINES AND DRILL STEEL

By GEO. H. GILMAN

Basing my opinion upon the result of an analysis of the general Rock Drill situation, conducted on the strength of the summary of questionnaires that this committee now has before it, I believe it inadvisable for this committee to recommend the standardization of parts that enter into the construction of the Rock Drilling Engine proper, in view of the possible danger that such procedure will be contributory to a state of stagnation as applied to development, which neither the up-to-date manufacturer nor the mining industry desires.

The development of the Rock Drill has been slow, and it is today in a state of evolution. New models are constantly being developed that are superior from the operator's viewpoint to the machines which they will eventually supercede. In many cases it is merely the refinement of detail which determines superiority. Suggestions for improvement are always welcomed by Designing Engineers and such suggestions as those presented by Mr. Arthur Notman at the last annual meeting of the committee are especially valuable as a means of general guidance for the machine designers.

In the design of a Rock Drilling engine, weight of machine and general type are the major fixed stipulations. With a given weight and general type stipulation the designer must strive to secure maximum effectiveness and efficiency for the conditions of the work; and as cylinder diameter, weight of hammer piston, and length of stroke are the principal determining factors, the entire mechanism must of necessity be pyramided upon the design of the piston hammer motion. Suitable provision must be made for the automatic rotation of the drill steel, cushioning of the piston hammer, introduction of air and water for cleaning the drill hole, automatic lubrication of all working parts, feeding of the machine, throttle control, locking the drill steel in position, proper drill steel change, the adaptability of the machine to the

saddle of the support and many other minor features. In consequence of this and the present state of the art, designers must work in ounces and fractions of an inch, for which reason it is oftentimes impossible to conform to a set of fixed specifications that embody detail of design. Furthermore I believe the standardization of parts such as cradles, feed screws, crank handles, side rods, standard rods, oil plugs, water tubes, etc., would eventually prove to be disadvantageous to the users. Such parts, if it were possible to standardize them, would be thrown upon the open market and the drill manufacturers would, if they attempted to maintain the required standard of quality of product and field service that is now rendered the user, be forced to increase the price of such parts of the machine as they produce and market, in order to compensate for the loss in revenue from the sale of other parts that would probably be diverted to other channels.

Again I believe such procedure would work an injustice on the legitimate Rock Drill manufacturer, for if the user should resort to the expedient of equipping the vital parts of a machine of one manufacturer with less important parts of questionable quality of some other manufacturer, the upkeep cost of the machine might be greatly influenced adversely to both the user and the manufacturer of the vital parts of the machine.

I therefore suggest that this committee restrict its endeavors to the standardization of the following:

(1) Types and sizes of Rock Drilling Machines.
(2) Names to designate the different types and sizes of machines.
(3) Drill Steel for use with these machines.
(4) Hose and hose fittings.
(5) Mining columns or bars.

I offer as a suggestion that this committee standardize the names of different types of machines. Machines should be given names descriptive of something connected with the kind of work for, or the way in which they are commonly intended to be used, and machines of the same name should be distinguished according to whether they are wet or dry, mounted or unmounted, have feed screw or air feed, piston ratchet or motor rotation, and the type of drill shank with which they may be used, or by some other distinguishing characteristic.

Machines should not be given names already adopted by manufacturers as trade names, for the reason that such names are the exclusive property of such manufacturers and who, therefore, can prevent others from using them. It would be futile for this committee to try to induce all manufacturers to use the same name for a given type of machine when that name has already been appropriated by one manufacturer and who, if he is zealous of the right the Law confers on him, can go into the Courts of Law to prevent its use by anyone except himself.

It is unfortunate among the users of Rock Drills that some of

the trade names employed by certain of the Rock Drill manufacturers have become established as designating certain definite types of machine. It will be impossible for the committee to employ them because their adoption by other Rock Drill manufacturers is precluded. Obviously under this condition, it remains for this committee to suggest and endeavor to have adopted other names. For example, it will not be disputed that among the users of Rock Drills, the name "Jackhammer" indicates a distinct type of machine. This name is used as a trade-mark by a certain manufacturer and the right to use it rests exclusively with such manufacturer. According to the law of trade-marks, no other manufacturer can use this name or any name so similar thereto as to be liable to be confused therewith.

To ascertain the trade names used by the various Rock Drill manufacturers, it is suggested that the committee request the various manufacturers to furnish this committee with a list of their trade names used for Rock Drill.

I have endeavored to formulate names for the different types of Rock Drilling machines commonly used in mining and as a result submit for a basis of discussion the following:

HEAVY DRIFTER—A two man mounted hammer drill used for heavy drifting and tripod work.

LIGHT DRIFTER OR BREAST STOPER—A one man mounted hammer drill used for breast stoping, light drifting and tripod drilling.

HEAVY HAND HAMMER OR SINKER—An unmounted hand held hammer drill used for heavy blast hole drilling in shafts, open pit mining, and deep hole drilling in quarries.

MEDIUM HAND HAMMER OR BLOCK HOLER—An unmounted hand held hammer drill of medium weight used for block hole drilling in boulders, light blast hole drilling in stopes, quarry work, etc.

AUGER HAMMER—An unmounted hand held hammer drill having a high rotation torque and a comparatively light percussive action. Used for blast hole drilling in hematite iron ore, hardpan, gravel and soft rock formations.

LIGHT HAND HAMMER—An unmounted hand held hammer drill of minimum weight, used for scaling walls and hitch cutting from ladder or staging, light pop-holing, etc.

OVERHEAD STOPER—An air feed overhead stoping drill used for overhead drilling in stopes, raises, and for roof work.

In the event of the adoption by this committee of the names suggested in the foregoing, I offer as a further suggestion that the queries of the questionnaires as acted upon by the various mining concerns to whom it was sent, be modified to conform with the following:

SUGGESTED WORDING OF QUERIES TO QUESTIONNAIRES

(1) Scope. Shall the committee confine its investigation to the standardization of the water drill, or to both this and the dry drill?

(2) Is it possible to use but one diameter of column or column arm? If so, what size?

(3) What kind of drifting machine incapable of being unmounted and hand held do you use? State make and type.
(4) How many of each?
(5) What kind of stoping machines do you use? State make and type.
(6) How many of each?
(7) What kind of hand held hammer drills do you use? State make and type.
(8) How many of each?
(9) How many hand held hammers are mounted? Unmounted?
(10) How many air feed overhead stopers do you use and how many of these employ water for cleaning the drill hole?
(11) How many unmounted hand held hammer drills do you use and how many of these employ water for cleaning the drill hole?
(12) How many overhead stopers with air feed do you use equipped with sprays to lay the dust?
(13) How many hand held unmounted hammers do you use equipped with sprays to lay the dust?
(14) In your opinion, what is the maximum permissible weight of drifter for approximately 90% of the ground in your mine?
(15) In your opinion, what is the maximum permissible weight of unmounted overhead stoper with air feed, for use in your ground?
(16) In your opinion, what is the maximum permissible weight of the unmounted hand held hammer for use in your ground?
(17) In your opinion, is it possible to build a machine to take the place of both your drifter and unmounted hand held hammers?
(18) What is the maximum permissible weight for such a machine?
(19) Has your company conducted experiments to determine the practicability of using the same machine for all kinds of blast hole drilling except overhead stoping, by adapting a hand held machine to a mounting?

STEEL

(20) What kind of lugged shank hollow drill steel do you use? State cross section and percentage of each kind.
(21) What is the diameter of the hollow steel used under query 20?
(22) Same as query in questionnaire.
(23) What kind of steel is used with your unmounted air feed machine for overhead stoping? State cross section and percentage of each kind.
(24) What is the diameter of the steel used under question 23?
(25) Same as query in questionnaire.
(26) Do you use solid or hollow steel with your unmounted hand held machines? State cross section and percentage of each kind.
(27) What is the diameter of the steel used under question 26?
(28) Same as query in questionnaire.

HOSE AND HOSE FITTINGS

(29) Same as query in questionnaire.
(30) Same as query in questionnaire.
(31) What makes of connections do you use?
(32) Same as query in questionnaire.
(33) Same as query in questionnaire.
(34) As the present trend seems to be towards the use of the water drill exclusively, would it be advisable to try to make the standard water drill hose coupling adopted as standard, applicable for use with the dry machine?

DRILL STEEL

I offer as a suggestion that drill steel be standardized as to cross section of the body, type of shank, change length, and gage diameter of cutting end for the different change lengths.

It is obviously impossible to adopt a uniform size and shape of drill steel that will conform to the requirements of the different types and sizes of rock drilling machines. However, I believe it thoroughly practicable to restrict the number of types of drill steel to three or possibly five and satisfactorily meet the requirements of 95% of the rock drilling work encountered. Accordingly I offer for consideration by this committee, the following:

(1) A 1¼" round hollow drill steel equipped with a 1¼" round shank lugged 3⅛" long, having a change length of 24" with a minimum drill bit gage diameter of 1 7/16" and a gage variation of 1/16" for the various change lengths.

Applicable to the heavy drifer.

(2) A ⅞" quarter octagon hollow drill steel equipped with a ⅞" quarter octagon collared shank 3¼" long, having a change length of 12" with a minimum drill bit gage diameter of 1¼" and a gage variation of 1/16" for the various change lengths.

Applicable to the light drifter or breast stoper, heavy hand hammer or sinker, medium hand hammer or block holer, light hand hammer, and the overhead stoper.

(3) A 1½" solid cruciform or a 1⅝" diamond section, twisted drill steel equipped with a ⅞" quarter octagon shank collared, 3¼" long, having a change length of 18" with a minimum drill bit gage diameter of 2" and a gage variation of ⅛" for the various change lengths.

Applicable to the auger hammer.

Without any attempt to precipitate discussion on the merits of the feature and based merely upon the present use of the anvil block type of chuck with which many of the rock drilling machines are equipped to permit the employment of plain shanked drill steel without collar or lugs, I offer as a suggestion that this committee recommend the standardization of the two following sizes of plain shanked hollow drill steel which will satisfactorily meet the requirements of the different machines when equipped with the anvil block chuck:

(4) A 1" quarter octagon hollow drill steel equipped with a 1" quarter octagon plain shank 7½" long, having a change length of 24" with a minimum drill bit gage diameter of 1 7/16" and a gage variation of 1/16" for the various change lengths.

Applicable to the heavy drifter when equipped with the anvil block chuck.

(5) A ⅞" quarter octagon hollow drill steel equipped with a ⅞" quarter octagon plain shank 6" long, having a change length of 12" with a minimum drill bit gage diameter of 1¼" and a gage variation of 1/16" for the various change lengths.

Applicable to the light drifter or breast stoper, heavy hand hammer or sinker, medium hand hammer or block holer, light hand hammer and overhead stoper when equipped with the anvil block chuck.

HOSE AND HOSE FITTINGS

As applied to the standardization of hose fittings, I wish to again present for consideration by the committee, the suggestion

submitted on the occasion of the last annual meeting and as my recommendations in this regard were fully described in the June 5, 1920, issue of the Engineering and Mining Journal, further description at this time will be unnecessary. I wish to state, however, that the type of socket joint recommended is readily adaptable to the present day models of rock drills without a material change being necessary and in construction it is of such a nature that its parts are adaptable to automatic turret lathe manufacture which has a direct bearing on cost of production. Every member of the committee is familiar with the cone joint of the ordinary pipe union and the suggested socket joint is but an adaptation of the other.

Upon request, I will be glad to furnish drawings illustrating the manner by which the socket joint coupling may be applied to its various uses in connection with rock drill service.

AIR AND WATER SUPPLY HOSE

It is suggested that specifications for air and water hose should be standardized in the following respects:

(1) Kinds of hose.
(2) Sizes of hose.
(3) Thickness of wall.
(4) Length of hose.

KINDS OF HOSE

For the air supply of drilling machines, it is recommended that this committee consider the standardization of (a) plain braided hose, (b) plain wrapped hose without wire winding, and for the water supply, corresponding wrapped hose of slightly thicker wall in proportion to inside diameter equipped with a covering of armor of half round galvanized steel wire 7/32" by 3/64" wrapped with a ¼" space between adjacent wires.

The sizes of hose should be standardized for the different drilling machines and it is recommended that the following sizes be adopted:

(1) Air supply hose of 1" inside diameter for the heavy drifter.
(2) Air supply hose of ¾" inside diameter for the light drifter or breast stoper, heavy hand hammer or sinker, medium hand hammer or block holer, auger hammer, light hand hammer and the overhead stoper.
(3) Water supply hose of ½" inside diameter for the water supply of all drilling machines.

A fifty-foot length of hose is recommended for the air supply and a twenty-five foot length for the water supply of all drilling machines.

With the inside diameter and thickness of wall established, the outside diameter may be determined. It is very desirable that the outside diameter be standardized in order to permit of the standardization of clamps and clamp bolts. It is therefore recommended that a minimum and maximum tube and cover thickness for the different sizes and grades of hose shall be established as follows:

Nominal Inside Diameter	Minimum Outside Diameter	Maximum Outside Diameter
Plain Braided Air Hose		
¾"—3 braid	1¼"	1 5/16"
1"—3 braid	1½"	1 13/16"
Plain Wrapped Air Hose		
¾"—5 ply	1 5/16"	1⅜"
1"—5 ply	1⅝"	1¾"
Armored Wrapped Water Hose		
½"—7 ply	⅞"	15/16"

The wrapped hose comprises a tube of rubber, around which is wrapped a cotton fabric, the number of layers of which determine the ply of the hose. Usually if the hose is of 5 ply construction, there are four layers of fabric adjacent the tube, over which is a layer of rubber, the whole being wrapped with an outer covering of fabric. The purpose of the intermediate tube of rubber is to afford added protection against leakage in case of injury to either the inner tube or the covering. This type is sometimes referred to as double tube hose.

The braided hose comprises a tube of rubber, around which is braided or woven a series of canvas tubes, protected by an outer cover of rubber. Its construction necessitates a slightly higher selling price. In comparison with the wrapped hose it has the advantage of affording greater strength in proportion to the thickness of wall; the herringbone braid being without seam does not easily unwrap and withstands the effect of kinking much better than wrapped hose. The tough rubber cover applied to this type of hose is of great advantage in its resistance to abrasion and eliminates the necessity of wire wrapping or other armoring.

I question if it would be advantageous for this committee to recommend the standardization of tube and cover thickness for mining drill hose, as such specifications would be of no significance unless the quality of the rubber should also be specified. A thick layer of rubber properly compounded would be much more efficient than a thick rubber of inferior quality. Accordingly specifications would be of no value unless they completely covered the subject and described the construction and quality of the hose throughout.

Hose manufacturers do not as a rule place much emphasis on the thickness of tube and cover, owing to the fact that it is secondary in importance to quality, particularly the ageing quality of the rubber and also the oil resisting quality of the tube and the capacity of the cover to adhere to the fabric and to resist abrasion. These factors are largely a product of chemical compounding rather than the thickness and amount of material used.

Regardless of the fact that the American Society for Testing Materials has prepared specifications applicable to various kinds of hose, I believe it to be impractical for this committee to

recommend specific specifications to be followed by the trade generally in the purchase of mining drill hose. In the first place, manufacturers are constantly making progress in the development of improved construction so that any specifications that are acceptable to the committee might be out of date soon after their adoption. Furthermore, it would be difficult for purchasers to check up the manufacturer in order to determine if the specifications were conformed with, and such specifications could not justly be used unless accompanied by a thorough test. Rubber is an organic material and the problem is therefore quite different from that of metallic products, in that the physical and chemical tests involved are more elaborate and technical than the ordinary purchaser would be prepared to apply.

MINING COLUMNS, OR BARS

Pursuant to the standardization of mining columns or bars to meet the requirements of the standardized line of drilling machines, I suggest for consideration by this committee the following:

For the Heavy Drifter, a 3½" single screw column with 3½" arm when a single drill is employed, and a 4" double screw column with 3½" arms when two drilling machines are mounted on the same column.

For the Light Drifter or Breast Stoper, a 2½" single screw column with a 2½" arm when a single drill is employed, and a 3" double screw column with 2½" arms when two drilling machines are mounted on the same column.

By confining the standardization of columns and arms to the sizes specified, the committee will be enabled to restrict the number of mining saddles to two sizes, each of which shall be adapted to the 5" diameter cradle trunnion that is now generally considered as standard.

It is recommended that this committee consider the standardization of two different lengths of column arms for each size of column and that the length of the arm, measured from the center of the column to the extreme tip end, shall be as follows:

For the 3½" single screw column a short arm of 24" and a long arm of 30".

For the 4" double screw column a short arm of 24" and a long arm of 36".

For the 2½" single screw column a short arm of 18" and a long arm of 24".

For the 3" double screw column a short arm of 18" and a long arm of 30".

In the construction of all columns up to 7 feet in length, standard pipe is recommended for the body portion. For columns 7 feet and over in length, extra heavy pipe, except for the 2½" size of column in all lengths which should be made from extra heavy pipe.

When a standard length of column is specified, it will be understood to apply only to the closed or contracted length of

the column and that the length of pipe employed for the body portion shall be approximately 10″ shorter than the specified length of the column.

It is recommended that there shall be included in the equipment of all columns, safety clamps corresponding to the number of arms with which the column is equipped and in addition an open end wrench adapted to fit the nut of all column bolts with its handle so formed that it may be employed as a jack bar.

PROGRESS REPORT OF COMMITTEE ON STEAM SHOVEL EQUIPMENT

The progress that has been attained by the Committee on the Standardization of Steam Shovel Equipment has not been as great as this committee had hoped for. However, it is believed that the subject in hand has been started in such a way as to make us believe that results should be obtained that will add materially to the present available data concerning steam shovel equipment.

The work has been conducted along the lines of determining standard types of steam shovels which in the light of past experience would meet all requirements of the mining industry, but has not as yet gone into that phase of the question ascertaining defects that have been noted by operators in the present type of shovels now on the market. The subject, however, covers such items of equipment as locomotives, cars, standard design of track, locomotives and wrecking cranes, drilling and blasting, etc.

This question of standardization of work is a matter of growth and development which may take several years before a final and complete report can be agreed to for presentation to the Mining Congress. This work of Standardization of Steam Shovel Equipment was started out with the thought that satisfactory progress could probably be made in the standardization of steam shovel equipment, as applied to certain work which such equipment has to perform, and the idea was to investigate by a form of questionnaire the different kinds of equipment used at the various mines and by contracting firms. With this thought in mind, on September 8, 1920, a request was made on each one of the members to outline a form of questionnaire that would cover this subject, which finally resulted in a tentative form, prepared on November 29, 1920, containing some forty-five questions.

It was believed that after answers to the questionnaire had been received that a general description of certain classes of work for which certain types of shovels, with their various equipment, would be suited for, could be stated.

A number of completed questionnaires have been received, but as all are not yet in the hands of the chairman, it is impossible at present to send a summary of the results.

Mr. T. A. Snyder of the Bucyrus Company, So. Milwaukee, Wis., has proposed a questionnaire covering the standardization of mine excavating machines. He has also included questions relative to electric machines.

It is the hope of the committee that by the next meeting of The American Mining Congress at least a summary of answers to questionnaires will be available for publication.

Signed by H. C. GOODRICH, Chairman.

PROGRESS REPORT OF COMMITTEE ON MINE VENTILATION

Owing to the fact that a number of mines are closed down, it was impossible to have any large number of the mine ventilating questionnaires, previously mailed out, filled in and returned by the various mining companies. The compilation, therefore, of data from this source, which would have been of considerable value to the committee in working out standards, was out of the question.

In lieu of the information mentioned above, as chairman of the committee on metal mine ventilation, I should like to submit the following principles for your consideration.

It is the earnest desire of your chairman that you will give each principle due consideration, denoting those which meet with your unqualified approval, and commenting on all those with which you are at variance, offering suggestions for amendment.

During the ensuing year it will be the object of the committee to expand these principles and enter into discussions of important details connected with ventilating problems.

No. 1.—That all working shafts be downcasts, smooth-lined, and fireproofed.

It is highly desirable that all working shafts be downcasts. Should any gas form in a mine (either from explosives, mine fires, or stratas generally) it naturally would seek its way to surface through the upcast shaft. Were the main working shaft an outlet, instead of an intake, it would greatly add to the danger, as a large number of the men would naturally endeavor to leave the mine by the main working shaft, (through which the gas was exiting to surface), rather than seek safety through some auxiliary and less familiar shaft. Moreover, there is always considerable work being done through the main shaft, and, if it is an upcast, the men employed in its vicinity are always at a disadvantage as they work continually in vitiated and impure air, which has already passed through a large proportion of the main workings.

In cases where sufficient shafts have been sunk on the property to take care of the entire ventilating system—both intake and outlet air—without using the main working shafts, then these latter may remain neutral. However, even in such cases, it is more desirable to make these shafts slight downcasts, in order to maintain a freshness in the air, and provide for emergencies in the event of possible mine fires, which might turn a neutral into an upcast shaft.

It has long been recognized that a smooth-lined shaft does not offer the same amount of resistance to the air currents, as that offered by the

ordinary timbered shaft. Experiments show that a very much larger volume of air can be passed through a smooth-lined shaft, than through an ordinary shaft, using the same amount of horsepower in each case. Smooth-lining may be accomplished by the use of ordinary boards, but such construction does not constitute a fire-proof shaft. The most satisfactory form of smooth-lining, which is also fireproof, is the concrete shaft. Another form of smooth lining and fire-proofing is the use of brick, or faced rock and mortar. Still another form, is the use of gunite and metal lath, also concrete slabs, which are placed flush with the shaft timbers and cemented in.

The value of fire-proofing main working shafts cannot be questioned, as numerous accidents have occurred in the past which have demonstrated the necessity of having all downcast shafts fireproofed, as an insurance measure against the loss of life and property.

If, however, the life of a shaft, or of the mine itself, does not justify the cost of a first-class fire-proof shaft, some other method of fire protection should be adopted. That most generally used, is the installation of water sprays (controlled from surface) in both the shaft and shaft stations. In addition to such a spraying system, a complete control of the ventilating currents on each level, by means of fire doors, must be provided. These should also be controlled from surface. Unless an absolute check of the ventilating current, by means of these doors, is obtained, the water from the sprays would, in the case of a shaft fire, force the smoke and gas into the workings.

No. 2.—The areas of all downcast working shafts should be large enough to permit a sufficient volume of ventilating air to pass through without an excessive velocity. Where working shafts are already in operation, other provisions must be made, but when the sinking of new working shafts is contemplated, this point should be borne in mind. As a matter of fact, in many cases, the areas of main working shafts are entirely too small for efficiency purposes, quite apart from the question of good ventilation.

No. 3.—In all downcast shafts, the cages should be provided with gratings on the bottom, in order to offer as little resistance to the air as possible, and the bonnets should also be made of screening instead of sheet iron, in order to allow air to pass through. The screening used, however, must be fine enough, and strongh enough, to avoid all danger from falling rock.

No. 4.—Provision should be made at all downcast shafts for fireproof head frames, such as steel or concrete, and all buildings adjacent to shaft collars should also be fireproofed.

No. 5.—As, in general, there is considerable air movement in all shaft stations, and as the majority of shaft fires have occurred in such locations, all stations should be fireproofed simultaneously with the shafts.

No. 6.—Where shafts are sunk for ventilation purposes only, such shafts should be circular and fireproof. The use of the circular shaft has been found through years of experience, to be preferable to the square or rectangular shaft, on account of its smaller perimeter for the same area.

No. 7.—The total outlet area of a mine should always be larger than the total intake area. Air entering a mine usually rises in temperature in its passage through the workings, thus increasing its volume. Therefore, the larger the final outlets of the mine, the less will be the resistance, and less power will be required to force the given volume of air through the workings.

No. 8.—It is advisable that the velocities in main operating shafts do not exceed 1500 feet a minute. This, however, does not apply to shafts which are used for ventilation only, and which are not used as traveling ways for men, as the velocity in these latter shafts may be much higher.

No. 9.—Wherever the mining method permits, the ventilating air should be drawn off on various levels, rather than forcing the entire volume down to the bottom of the shaft and allowing it to exhaust upwards through the workings. The former method will allow a more even distribution of air throughout the entire mine workings, with a great deal less friction than the latter. Moreover, in the latter method, where the air is carried to the lowest level before being split up, the entire volume is, first of all, drawn through restricted areas for great distances, which naturally results in the maximum amount of friction.

Secondly, the impurities and moisture taken up by the air in the lower workings are then carried upwards continuously, through all the upper levels, having not only a detrimental effect on the men, but keeping the upper workings in a moist and usually hot condition.

It has long been recognized that wherever possible, the division of a mine into separate ventilating districts, or air splits, is most advantageous. The currents of air, after being used to ventilate such districts should not be used to ventilate other workings, but conducted as directly as possible to the upcast shafts.

No. 10.—It is recommended that the metal mines be urged to adopt standard areas for tunnels, drifts, passage-ways, and raises, which, while conformable with economy, will permit the maximum flow of air, with the minimum friction.

The use of frequent raises, in ore bodies mined by practically every underground mining system, has been found to be most advantageous from an efficiency standpoint, as the greater the number of raises, the less the hand labor required in passing the ore, and the greater the efficiency. The use of such frequent raises should be encouraged, as they greatly aid the distribution of air and decidedly improve the general ventilation.

No. 11—So-called "abandoned workings" in metal mines, from which the ore has not been entirely extracted, or which have future prospect values, should be provided with some form of economical regulator door or stopping, which, while cutting off the major flow of air from entering these so-called "abandoned workings," allows sufficient air to pass through to prevent decay. Abandoned workings which are filled with waste, or cave of their own weight, and from which all ore has been extracted, require no ventilating air, and generally seal themselves. In rare instances, where worked-out areas which have no future value do not cave of their own weight, and contain no fill, they should be sealed off in order to conserve the ventilating currents.

No. 12.—In all new sections of a property, which are being developed for stoping purposes, the ventilation should be planned simultaneously with the stoping, and expanded along with the mining operations.

No. 13.—For many years, the coal miners of both Europe and America, have recognized the great importance of air movement, not only in main traveling ways, but also at the various working faces. To secure such movement at the working faces in metal mines is far more difficult than in coal mining. However, the real test of an efficient primary metal mine ventilating system is the number of working faces which are provided with adequate air movement. This can be obtained through judicious coursing of the air currents, by means of air connections advantageously located, the use of stoppings, ventilating doors, brattices, occasional overcasts, etc.

No. 14.—In general, all mines should be provided with a primary and a secondary ventilating sysetm. The primary ventilating system to consist of large mine fans, advantageously located according to local conditions, and, if efficient, to thoroughly ventilate from 75% to 95% of the workings. The secondary ventilating system to consist of small blowers

with ventilating pipe, for use in dead ends only, such as long drifts, raises, or stopes located in isolated sections of the mine.

The secondary ventilating system should never be allowed to supercede the primary ventilating system, as such procedure is not only inefficient but very costly. All efforts should be directed towards improving the primary ventilating system, in order to have it ventilate as much of the mine as possible.

No. 15.—The use of either pressure or exhaust systems cannot be standardized, but must be decided according to local conditions at the mine about to be ventilated. This also applies to the location of fans for primary ventilating systems. Certain conditions may require surface installations, while other mines may be served more adequately by fans installed underground. The design and size of fans, volume of air, and water gauge, all depend largely on local conditions.

No. 16.—In general, large mine fans should be reversible.

No. 17.—In mines which are so dry that dust is readily formed, spraying systems should be installed to lay the dust and humidify the mine air sufficiently to prevent excessive evaporation.

Signed by CHAS. A. MITKE, Chairman.

DISCUSSION

During the discussion, the advantages of smooth lined over timbered shafts was brought out by Chairman Daly, who stated that experiments had demonstrated that there was a notable decrease in friction where smooth-lined shafts were used.

In regard to sizes and dimensions of equipment for secondary ventilating systems, Chairman Daly stated that the Anaconda Copper Company uses the following equipment for general purposes in its mines:

5 H.P. single phase 2½ blower.
7½ H.P. 2/3 phase 2½ blower.
15 H.P. No. 4 blower.
Piping:
Distances of 500 ft. in length, 10" pipe.
Distances 1,000 ft. in length, 14" pipe.
Distances 1,000 to 2,000 ft. in length, 16" pipe.
Distances beyond 2,000 ft. in length, 16" pipe and relay blowers.

PROGRESS REPORT OF COMMITTEE ON MINE TIMBERING

Reduction in the cost of timbering may result from use of such methods of mining as avoid timbering or permit the use of smaller sizes, in the use of cheaper timber, from economies in the cost of handling and framing, avoidance of waste and saving in freight.

The question of mining methods may safely be left in other hands for the present, merely calling attention to the fact that timbering in stopes should be considered as merely a temporary support while some other method of holding the ground is provided, as by waste filling, or until the openings are abandoned to collapse, if they will, as in slicing or caving. Smaller sizes and cheaper timber can be used in such cases. In this matter rapidity of extraction is essential.

There can be no question of the advantage of standardization at individual mines. Much can be done of benefit toward standardizing chutes and manways, for square set, top slice or similar methods of stoping or for prospect raises. In such a wide

variety of design as may be found in different mines there are a few of good sound construction, any one of which could be adopted to advantage and eccentric practice avoided. The newer methods of caving are not yet sufficiently uniform, nor have they reached such stable routine that general standardization can yet be approached.

In stoping by square set in the West the usual horizontal section of a set is 5'x5', but the height often differs, ranging between 7½' to 8½'. In Michigan the horizontal section is often greater. The appropriate section would appear to depend on the safe area that can be opened, without more than occasional temporary stulling to support the roof, before the timbers are set. The height is limited by convenience in putting up timbers and in handling the ground safely. The consumption of timber is reduced by making the sets higher and wider.

There is such a wide range in the character of ground and occurrence of ore that variations in practice are neccessary and desirable. A simple method of framing, however, can and should be adopted for each size of timber that would be accepted as a standard.

Square setting is particularly referred to, as in that method timbering and framing is of greater importance than any other. The same principles which control square set timbering may be applied to top slicing whether flat or inclined.

In other methods of stoping the quantities of timber consumed are less and its use is apt to be either unsystematic or highly specialized.

The spacing of drift sets is usually five feet from center to center. They differ in section and in height and width according to the requirements of operation. A better relation should be established between the section of the post and the cap, depending on the height and the span. It is not infrequent to see caps used that are too weak for the posts. Beyond making sure that the sets are correctly designed and lengths used that cut to advantage from the timber available, standardization will not greatly affect drift timbering.

In shaft timbering a great variety of sections and details of framing are to be found. An attempt should be made to standardize the dimensions of shaft compartments. This is of less importance in the case of properties making large production since they can pay for special equipment, but would be of great benefit to the smaller operators. It will affect them less in economy of timbering and framing than in making possible the standardization of shaft equipment, cages, skips, etc. The framing of shaft sets should be of simple design, and after standardization no doubt framing machines will be developed, for shaft timbering.

The recently designed timber framing machines have rapid adjustments that permit the framing of a great variety of cuts.

Drift sets of any size and square sets of various sizes and with different framing can be cut without difficulty. Special machines are now being made for certain purposes, to frame cribbing for instance, which also have sufficient range of adjustment to cover any reasonable variation in size.

It appears that several of the timber merchants in the Northwest are equipped to frame timbers. Few of the larger users of timber however, buy it framed. The price quoted by manufacturers for framing is a little bit higher than the cost of the better equipped mines. A framing plant will cost from $5,000 to $25,000, according to the elaboration of the equipment.

The advantages which might be expected to result from framing at the source, cheapness of framing, saving of waste in cutting, and reduction in freight. The lumber merchant should be able to frame timber cheaper than the operators of small mines. There seems to be an opportunity to develop this field which will require only a moderate degree of standardization. Its backwardness is not due to lack of standardization, but from failure to develop the market.

Mine timbers are cut from the timbers remaining after orders for better qualities are filled. The waste in cutting can be reduced by the variety of short lengths required. Much of the timber bought by the large users in the Southwest is in random lengths at a saving of $1.00 to $2.00 per thousand in price. Timber on which no framing is to be done is sometimes bought in specified lengths to save extra handling and passing through the cut-off saw.

If the proper control of cutting is followed, there need be little waste in framing at the mine from random length timber. The short ends remaining after framing should not be more than is needed for blocks or wedges, for which there is a constant demand. There should be sufficient short blocks and waste material at the mills to provide cheap timber to supply blocks and wedges for all mines, but perhaps because of failure to work up the business properly, the price asked of the mines appears to be on the basis of the full price of the timber, plus freight and something for labor of cutting. The only actual waste, therefore, when framing at the mine is in what is too small to serve for either blocks or wedges. At one mine in the Southwest the waste is only one per cent of the timber put into the framing mill. In this case there are barely enough blocks and wedges to supply the mine. The waste in cutting, therefore, is not greatly reduced by framing at the source.

Freight rates, at least in the Southwest, are the same for framed as unframed timber, but there are references to higher rates for framed timbers in certain sections which it has been impossible to confirm.

If blocks or wedges can be made from the salvaged timber, freight will be saved by framing at the source. If they must

be bought outside and brought in, there will be no saving. In the mines of Idaho, Montana and Michigan and Colorado the supply of timber is usually from points near the mines. In Utah and the Southwest it is carried long distances by rail or steamer, or both, and freight is a very important part of the cost. It would be considerably reduced by seasoning before shipment. It has been suggested that rough finishing would reduce the freight without reducing the strength of the material. This, however, will raise the classification, and consequently the freight rates in most cases.

There is apt to be a certain amount of loss or breakage in the unloading and other handling of the mine of long lengths of timber, which would be avoided by framing at the source. If, however, it is to be shipped by vessel, the cost of rehandling short lengths would be somewhat greater.

The use of round timbers is very common in Idaho, Montana and Michigan, and of increasing importance in the Southwest. If of equal quality it is very satisfactory. Its use in chutes and similar construction is rather inconvenient, as there are no flat faces to work to. It is also awkward and bulky to handle in small cages or trucks. It should be cheaper than square timber since there is no cost of manufacture. In many cases it is of local origin and freights are less than on squared timber which is distributed from the Northwest for great distances. In the Southwest, at least, most of the round timber has a shorter life underground than timber from Washington and Oregon. Its use, therefore, is restricted to temporary work, stopes that are shortly to be abandoned, etc. There is some difficulty in getting and using the proper sizes of round timber, and in some cases it has been found that the consumption of round timber is a little greater for the same purpose than when square timbers are used. From the convenience in handling, its longer life, etc., square timber from the Northwest is preferred to round timber from local sources at an equal price. A large part of round timber is cut from tracts where there are no mills and can rarely be framed at the source. The Anaconda method of framing square sets is recommended for round timber as it will take any size of stick that may be used.

There may be an opportunity to develop a method of treating such timber to prolong its life, but it must be cheap.

Timber economy as a whole can be promoted by treatment by painting or dipping in a preservative or by more elaborate method of injection into the body of the timber. Covering timber with gunite has added to the life of timber in the Butte district. There are many methods of preservation under investigation, and no doubt something good will result. Many of them, however, are so costly that they cannot be used except for special purposes, as for shaft or station timbering. A method of timber preservation is not satisfactory if it increases the fire risk.

There are a few practical substitutes for timber. Steel has been used successfully for permanent work, but is very expensive and will not often be economically possible. Reinforced concrete sets have been used also and offer some encouragement for level work, but 6″x8″ sections are as heavy as can be used without special methods of lifting. Heavier sections must be cast in place. It has been found that at times a light coat of gunite has eliminated the necessity of timbering.

Standardization may be expected to reduce costs by its application at individual mines and its moderate extension to all mines through national planning of mine structures both below ground and above. The standard of design would be raised, and by making chutes and other construction more or less similar their erection and use by miners who may be new to the district would be greatly facilitated.

By encouraging the framing of timbers at the source small mines would get their timbers framed cheaply without the cost to them of a framing mill. Beyond this no great benefit is apparent.

Logging and mill practice should be more thoroughly understood by mine operators. It appears certain that by thorough understanding of each others business methods by timber manufacturers and miners would result in mutual benefit.

I respectfully submit one or two recommendations for future action by the committee.

It will be advisable to have timber merchants represented on the committee, also a member who has had experience in timber treatment for preservation against decay.

As there is a great deal of ground to cover I suggest that each member of the committee be asked to cover some special subject, shaft sections, preservation of timber, substitutes for timber, etc.

The subject of timber preservation is of particular importance, and should be thoroughly treated.

Signed by GERALD SHERMAN, Chairman.

GENERAL RESUMÉ OF DATA OBTAINED FROM QUESTIONNAIRES SENT TO THE FOLLOWING SEVENTEEN MINING COMPANIES ON STANDARDIZATION OF MINE TIMBERS

(1) *Morenci Branch, Phelps Dodge Corporation.*
(2) *Copper Queen Branch, Phelps Dodge Corporation.*
(3) *United Eastern Mining Company.*
(4) *United Verde Extension Mining Co.*
(5) *United Verde Copper Co.*
(6) *Old Dominion Company.*
(7) *Calumet & Arizona Mining Co.*
(8) *Bunker Hill & Sullivan Mining Co.*
(9) *Inspiration Con. Copper Co.*
(10) *Magma Copper Company.*
(11) *Ray Consolidated Copper Co.*
(12) *Miami Copper Company.*
(13) *Nevada Consolidated Copper Co.*
(14) *Cleveland Cliffs Iron Co.*
(15) *Consolidated Arizona Smelting Co.*
(16) *Cananea Consolidated Copper Co.*
(17) *The Arizona Copper Co.*

Q. 1. From what section of country is your timber obtained?

ANSWERS:

Oregon, Washington and Texas are the chief producers of mining timbers. Northern Arizona, Northern California, Idaho and Northern Michigan produce small amounts of timbers which are consumed by nearby mines.

Q. 2. Transportation facilities and number of times handled before it reaches your mine?

ANSWERS:

For southwestern properties timber that is obtained from Oregon and Washington is taken to San Pedro by boat, thence by rail, generally, direct to the mines. In cases where local timber is used the most direct means of transportation is employed.

Q. 3. Kind of timber used, such as oak, spruce, cedar, pine, etc.?

ANSWERS:

Oregon pine (or Douglas fir) and Texas pine constitute the bulk of the timber used. Smaller amounts of Arizona pine, spruce, hemlock, Port Orford cedar, redwood, maple, birch, cedar and tamarack are also used.

Q. 4. How much is seasoned, and how much unseasoned timber?

ANSWERS:

There is not a very great difference in the relative amounts of seasoned and unseasoned timber used. No doubt in this respect the supply compared to the demand influences the amount of seasoning that can be done. Data follows: 6 companies used all seasoned timbers; 8 companies used all unseasoned timbers; 3 companies used part seasoned and part unseasoned timbers.

Q. 5. Total board feet used per year during each of the past five years?

ANSWERS:

Due to fluctuations in the past five years there is considerable variation in the yearly timber consumption shown by many of the mining companies. This fact necessarily makes our figures approximate, only. 114,500,000 board feet is roughly the total consumption per year of all companies supplying data.

Q. 6. What percent of above timber is sawed, and what percent round?

ANSWERS:

No. of Co.	% of Total Framed	% of Total Round	% of Total Split
1	80%	20%	
2	75%	25%	
3	100%		
4	100%		
5	97%	3%	
6	90%	10%	
7	80%	10%	10%
8		100%	
9	100%		
10	100%		
11	97%	3%	
12	64%	36%	
13	100%		
14		100%	
15	90%	10%	
16	78%	18%	4%
17	65%	35%	
Average	77%	22%	1%

Q. 7. What percent of total timber comes in standard lengths?

ANSWERS:

The list below showing the practice of each company in regard to buying timber in standard lengths is given for what it may be worth. It is doubtful whether this data can be used, inasmuch as there seemed to be, in the answers to the questionnaires, a difference of opinion as to the meaning of "standard lengths." In some cases it was taken as referring to standard lengths as regularly supplied to the trade by the lumber dealers. In other cases it was assumed that timber of lengths standard at the mine in question was meant.

No. of Co.	Percent
1	Random
2	30%
3	In multiples of 2'—100%
4	90%
5	Practically 100%
6	100%
7	100%
8	Random
9	
10	100%—Multiples of 2'
11	22% (mine lengths)
12	100%
13	100%
14	100%
15	100%
16	23% (Probably mine standard)
17	100%—Multiples of 2'

Q. 8. What percent of total timber is used in stoping, drifting, raising and sinking (winzes and shafts)?

ANSWERS:

No. of Co.	Stoping	Drifting	Raising	Sinking	Repairs	Miscellaneous
1	83%	4%	5%	1%	7%	
2	58%	8%	25%	2%	3%	4%
3						
4	78%	21%		1%		
5	90.7%	9.3% (dev.)				
6	75%	17% (dev.)			8%	
7	82%	5%	13%			
8	90%	5%	1.5%	3.5%		
9	45%	35%	20%			
10						
11	10%	89.5%	0.5%			
12	59%	19%	7%			
13	4%	7%	76%	13%		
14	55%	25%	20%			
15						
16	60%	27%	12%	1%		
17	82%	7%	11%			

Q. 9. What are the various sizes of timber used in stoping operations?

ANSWERS:

Size of Timber	No. of Co. Using	Size of Timber	No. of Co. Using
2" Boards	13	6x8	3
8x8	11	10x12	3
10x10	11	6x6	2
8" Round	8	6x10	2
3" Boards	7	Split Lagging	2
4" Boards	6	Poles	2
10 to 12" Round	5	12x12	1
8x10	4	10"-14" Round	1
5x8	4		

Q. 10. What are the various sizes of timber used in drifting operations?

ANSWERS:

Size of Timber	No. of Co. Using	Size of Timber	No. of Co. Using
8x8	11	8x12	2
10x10	11	8" to 10" Round	2
2" Plank	10	8x10	2
12x12	8	10x12	2
4" Plank	6	Split Lagging	2
3" Plank	4	6x10	1
6x8	4	6x12	1
Round Stulls	4	18" Round	1
12x14	3	Poles	1
10" to 12" Round	2		

Q. 11. What sizes of timber are used underground with no framing whatever, and what proportion of the total do they constitute?

ANSWERS:

Various sizes.

No. of Co.	Per Cent.	No. of Co.	Per Cent.
1	60%	4	20%
2	31%	5	61%
3	80%	6	35%

No. of Co.	Per Cent.	No. of Co.	Per Cent.
7	15%	13	None
8	1%	14	3%
9	None	15	....
10	None	16	14%
11	52%	17	38%
12	5%		

Average, 28%

Q. 12. What sizes of timber must be sawed once, with the cross-cut saw, before being used underground, and what proportion of the total do they constitute?

ANSWERS:

Various sizes.

No. of Co.	Proportion	No. of Co.	Proportion
1	50%	10	....
2	17%	11	52%
3	60%	12	95%
4	7%	13	34%
5	17%	14	3%
6	100%	15	50%
7	None	16	85%
8	1%	17	43%
9	60%		

Average, 42%

Q. 13. What sizes of timber must be framed, either by hand or by a framing machine, before being used underground, and the proportion of the total?

ANSWERS:

Various sizes.

No. of Co.	Proportion	No. of Co.	Proportion
1	40%	10	....
2	52%	11	48%
3	20%	12	1%
4	60%	13	66%
5	39%	14	97%
6	70%	15	30%
7	70%	16	....
8	100%	17	19%
9	40%		

Average, 47%

Q. 14. Is there any timber framed at its source and shipped to you framed? If so, what sizes and what proportion of the total?

ANSWERS:

Thirteen out of the seventeen companies have no timber whatever framed at the source; one has all of its timber framed at the source, and three companies a small percentage. In this connection it is of interest that the freight rates from San Pedro to Clifton, Arizona, on framed and unframed timber are as follows:

	Per Ton	Per M.
Unframed	$ 8.10	$13.91
Framed	16.30	27.97

Q. 15. What does it cost you to frame your timber at the plant per 1,000 board feet?

ANSWERS:

No. of Co.	Cost per M.	No. of Co.	Cost per M.
1	$ 3.00	10	10.00
2	3.00	11	2.21
3	....	12	1.50
4	1.15	13	3.00
5	....	14	9.00
6	2.25	15	....
7	3.25	16	2.95
8	....	17	3.00
9	2.00		

Approximate average, $3.50

Q. 16. Is any of your stoping timber interchangeable with that used in your drifting or raising work?

ANSWERS:

Thirteen companies answered "yes." Four companies answered "no."

Q. 17. Have you at present definite or proposed plans for reducing the number of different sizes of timber used either in stoping or drifting? If so, will you indicate roughly the proposed nature of these changes?

ANSWERS:

Fourteen companies answered "no." One company answered "yes."

Q. 18. What timber framing machinery do you employ?

ANSWERS:

Name of Machine	No. of Co.	Name of Machine	No. of Co.
Cut-Off Saw	9	Dapper	3
Single End Framer	8	Cribbing Splitter	1
Rip Saw	6	Car Loader	1
Double End Framer	5	Wedge Bundler	1
Wedge Cutter	4	Dado	1
None	4		

Q. 19. What kinds of lagging do you use?

ANSWERS:

No. of Co.	Mining Method	Character of Lagging.
1.	Shrinkage, top-slicing, some sq. setting	2x12 split.
2.	Mostly sq. setting, some top-slicing, cut and fill (incline)	5' split, 2"x10" and 12"x5' sawed lagging.
3.	Horizontal cut and fill	2x12. Merch. O. P
4.	Sq. setting and Mitchell stoping	Oregon and Native Arizona, sawed lagging in 2" and 3" widths and lengths of 4' 8" and 5' 4".
5.	Horizontal cut and fill, sq. setting, shrinkage, glory-holing	5'4" and 7' 2" Native Pine.
6.	Sq. setting, horizontal top-slicing, cut and fill	Oregon Pine, 2" lagging only.
7.	Mostly incline cut and fill, sq. setting, Mitchell stoping	2x12", 3x12" and 4x12" lagging, 2x6"—5' long, split lagging.

8. Mostly sq. setting	2″ plank lagging, random widths, 4′11″ long, of which at least 50% is Douglas Fir and the remainder Tamarack, White Fir, Hemlock and Pine. When lumber supply is good, straight Douglas Fir is used, otherwise mixed lumber as above. These planks run from as narrow as 8 inches up to 20 inches in width and are cut by the mills from stock to the best advantage without waste by cutting in random widths.

No. of Co.	Mining Method	Character of Lagging.
9.	Incline raise system	Sawed—4′10″ by 2″x10″ and 2″x12″.
10.	Sq. setting, top-slicing	Native Pine and Oregon Pine.
11.	All shrinkage	2″x6″ Native—Side lagging for sq. sets and slicing. 2″x8″—Side lagging. 3″x10″—Top lagging for haulage drifts. 6″x6″—Top lagging for drawing sections. 6″x8″—Top lagging for drawing sections. 4″x6″—Spiling. 4″ 2x8″—Spiling.
12.	Shrinkage system	2″ and 3″ sawed plank
13.	Incline raise system	2″x12″—Lagging. 2″x6″ —Lagging.
14.	Mostly top-slicing	Cedar, Jack Pine, Spruce and Tamarack, split and round. Round lagging is not less than 2¼″ diameter, and split is not more than 150 pieces to the cord. For covering down floors we use 9′ and 10′ poles, cross-lagged with 5′ or 7′ lagging, mostly 7′, or we use 1″ maple boards 6″ wide or wider, 6′ long or longer. These also serve as sollars for shoveling. It takes about 1′ of board per ton of ore mined, where boards are used. With lagging at 1 cent a foot and boards at $40.00 per M., the two methods are about equal in cost.
15.	Cut and fill, shrinkage, sq. setting	4″x12″. Both Native and Oregon Pine. 3″x12″. 2″x12″. Split round timbers—6″x8″ tops.
16.	Top-slicing, cut and fill, sq. setting, shrinkage	California and Texas split, and Texas slab stock sawed lagging used.
17.	Top-slicing, shrinkage, cut and fill	Split lagging, 5′. 3″ round, 10′. 2x12, 5′.

DISCUSSION BY GENERAL CHAIRMAN CHAS. A. MITKE OF INFORMATION OBTAINED FROM QUESTIONNAIRES SENT TO SEVENTEEN LARGE MINING COMPANIES ON STANDARDIZATION OF MINE TIMBERS

Replies to Questions 1, 2 and 3 need not be commented on.

Question 4. How much is seasoned and how much unseasoned timber?

Comment. It is evident that at least eight companies purchase all unseasoned timber. However, it may be stated in safety that these particular companies purchase such large quantities of timber at one time that a large percentage of it becomes seasoned before it is used.

It is a well-known fact that seasoned timber does not decay as readily as unseasoned timber, and wherever possible seasoned timber should be used in all drift and raise work.

In lining up the final recommendation of the Timber Committee it might be well to include among the findings a recommendation to the effect that "seasoned timber should be used in all drift and raise work."

Question 6. What percentage of total board feet of timber used during the year is sawed, and what per cent round?

Comment. The replies to this question show a notable increase in the amount of round timber used. Only six to ten years ago, practically all timber used was square, and while at present some companies are using as low as 3 per cent round timber, others are using as high as 100 per cent. This, undoubtedly, is a notable saving for those companies who use a large amount of round timber. A detailed examination of the questionnaires show that Companies Nos. 8 and 14 use 100 per cent round timber; that Company No. 12 has increased its purchases of round timber from 15 per cent in 1915 to 36 per cent in 1919; that Company No. 16 has also increased the amount of round timber used in its mines from 6.33 per cent in 1916 to 18.25 per cent in 1919; that Company No. 2 now uses 25 per cent round timber in its mines, whereas not long ago the amount was practically zero; that Company No. 11 and Company No. 6 are contemplating experiments with the use of round timber instead of square, and that Company No. 17 uses 35 per cent round timber in its mines.

It would be interesting, in this respect, to hear from Company No. 8 and Company No. 14, as to why they prefer the use of all round timber, and if their use of all round timber is just as satisfactory as if they were using all sawed square timber. A similar inquiry addressed to Company No. 12, Company No. 16 and Company No. 2, inquiring as to the basic reasons which impelled them to increase their purchases of round timber, should be productive of much interesting information. Inquiries addressed to Nos. 6, 11 and 17 in this same respect should also prove helpful.

It would also be interesting to hear from Company No. 5, as to what has been the determining factor which has caused them to reduce their percentage of round timber from 34 per cent in 1916 to 3 per cent in 1920, also why they have announced their intention to discontinue the use of round timber altogether; also to hear from Companies Nos. 3, 9 and 10, as to why they prefer square to round timbers.

Question 8. What per cent of total timber is used in stoping, drifting, raising, and sinking (shafts and winzes)?

Comment. Apparently by far the larger proportion of all timber used goes into stoping and is usually not recoverable under any circumstances. Drift timber is recoverable at times, but it is generally impossible to salvage any of the timber used for repairs, raising and winzing.

Question 9. What are the various sizes of timber used in stoping operations?

Comment. The resumé shows the various kinds of timber but omits the exact sizes of timber for the various mining methods. For example, the following information would lead to concrete results:

Exact dimensions of all timbers used in square set stoping in each particular mine.

Exact dimensions of timbers used in all top-slice stopes in each particular mine (horizontal and incline).

Exact dimensions of timbers used in all cut and fill stopes in each particular mine (horizontal and incline).

The above would not, of course apply to the caving systems; however, the following information might be obtained from these:

Exact dimensions of timbers used in pony sets.
Exact dimensions of timbers used in chute sets.

The following information might be obtained from all companies:

Exact dimensions of timbers used in raise sets.
Exact dimensions of timbers used in drift sets.
Exact dimensions of timbers used in tunnel sets.

Were this information segregated, and tabulated under the various stoping methods used, it would then be very much more suggestive. For instance, under square sets, the number of companies using this method might be given, with the various sizes of square sets employed. The same would refer to cut and fill (incline and horizontal); top-slicing (incline and horizontal) and the caving methods. This investigation would reveal, in the first place, that all companies using the square set method have different dimensions for the length, width and height of their square set timbers. Some of the companies having the heaviest ground use the largest size square sets, while companies with medium or light weight ground use the medium or small size square set, which is only intended really for very heavy ground.

If the above information were available and put before the committee, it might then be found possible for the committee to arrive at some recommendations for two or three standard size square sets for the light, medium and heavy ground. A similar investigation would reveal floors being taken out by top-slicing, from 7 feet to 11 feet in height. The investigation may show the practicability of recommending certain length and sizes of posts, kind of lagging, sizes of chutes, etc., which are suitable and have been found by experience to be the most advantageous for all incline top-slicing. This investigation would also show the possibilities of the application of standardization to horizontal top-slicing, incline and horizontal cut and fill, and to the caving methods.

Question 10. What are the various sizes of timber used in drifting operations?

Comment. The comments and suggestions made under Question 9 would apply equally to Question 10.

Instead of the multiplicity of drift and tunnel sets now in use, it may be possible for the committee to select from all the various dimensioned drifts three or four standard types of drift sets, ranging from the small prospect drift to the large size motor tunnel.

Questions 11, 12, 13, 14, 15 and 16.

Comments. The tables and information given in reply to the above questions are most interesting and well worth further consideration.

Question 17. Have you at present definite or proposed plans for reducing the number of different sizes of timber used either in stoping or drifting? If so, will you indicate roughly the proposed nature of these changes?

Comment. An investigation regarding the further standardization of mine timbers will automatically stimulate interest in this subject, and therefore the replies to this question cannot be accepted as conclusive. Nearly all companies at the present time are either working at plans for standardizing their timber still further, in order to effect greater economies, or they are working on present standards in order to change these to better satisfy local conditions. A close observer, making constant visits, can always notice a slow but perceptible change taking place as regards timber standards, which leads one to believe that progress has not by any means stopped in the standardization of timber.

In looking over the individual answers to No. 17, I note that Companies Nos. 6 and 11 are planning some experimental work by substituting round for square timbers. Incidentally, although not mentioned in the questionnaire, Company No. 4 has been doing some experimental work with the use of concrete sets in places where the life of the timber is very short. Company No. 7 has been doing a great deal of experimental work with different kinds of drift sets. I believe the summary of replies to this question would be more suggestive had it been arranged in the following manner:

Eight companies answered "no," the others replied as follows:

No. of Co. Reply

1. Owing to the indefiniteness of our plans we have at present no definite scheme for reducing the number of different sizes of timber used.

5. We have reduced the number of sizes by 30 per cent in the past three years. Do not believe we can make further reduction in this number, as we have only two types of drift timber (drift and gangway), one size of lagging, one size of bulkhead timbers, and a single and double cribbing.

6. No proposed plans except the use of split lagging instead of sawed, and round timbers instead of square.

9. We have standardized drift sets, pony sets, chute sets, and square sets in raises.

11. Speaking generally, we have in view the substitution of smaller timber in a few cases where experience seems to warrant so doing. We also plan to experiment with substitution of round posts for square posts in exploratory drifts, with 5" round lagging instead of 6"x6" lagging in drawing sections, and with slab lagging instead of 2x8 side lagging.

13. There are no plans at present time for reducing the sizes used in drifting or stoping.

14. We have standardized on 8' sets and 5'4" cribbing, so that there will be no waste in a 16' log. All framing has been adapted to standard log lengths. All round timber used.

16. No changes contemplated at present.

17. Not worked out sufficiently to know what we will do.

Question 18. What timber framing machinery do you employ?

Comment. The replies to this question are interesting but need not be commented on.

Question 19. What kinds of lagging do you use?

Comment. It appears there is a great variety of lagging used. Some companies use lagging only 2" in thickness, while others go to the great expense of using lagging 6" thick. Some prefer it sawed, while a great many prefer split lagging, etc. A great many caves occur in square set stoping, and it is believed that this is entirely due to the use of unsuitable lagging, which breaks and allows the caves to start.

MINE TIMBER PRESERVATION

R. R. HORNOR* and GEO. M. HUNT**

Of the enormous volume of timber used each year by the mines of the United States a considerable percentage is used above ground or in permanent haulageways and other places which are to be kept open for a number of years. When such timber decays rapidly, as it very commonly does, and must be renewed every two, three or four years, the result is high timbering costs, interference with mine operation, increased danger of accidents, high fire hazards, and rapid depletion of the timber supply adjacent to the mine. Many mines which formerly were able to obtain durable timber cheaply are now forced to take what they can get and are faced with the necessity of very soon drawing their timber from distant sources with consequent high costs.

The expense of timbering is not so likely to be noticed during periods of great prosperity when the demand is chiefly for pro-

*Mining Engineer, U. S. Bureau of Mines, Washington, D. C.
**In Charge, Section of Wood Preservation, U. S. Forest Products Laboratory, Madison, Wis.

duction, but in times like the present, when business is slack and mines operating part time or not at all, it becomes very noticeable. When it is necessary to keep a considerable number of men busy renewing timber, while not a pound of ore or coal is being produced, the leak becomes noticeable.

In deep mines, where the problems of the ventilating engineer multiply, large quantities of decaying timber add to his difficulties by vitiating the air and increasing the temperature. Warm and vitiated air lowers the efficiency of the workmen and reduces their output. The magnitude of this element in mine ventilation is not fully realized, and it cannot be fully realized until more study has been given to it, but that it is of real importance can hardly be denied.

Perhaps the greatest menace with which the mine operator has to contend in mines where large quantities of timber are used is the fire hazard. A number of disastrous fires in recent years have resulted in great loss of property and in some cases loss of life. Decaying and punky timber, especially where the bark has not been removed, is a greater fire menace than sound peeled timber. Therefore any steps which will prevent mine timber from decaying will lessen the fire hazard.

The useful life obtained from mine timbers varies widely, depending on the species of timber used, its quality, the care given it while in storage, and the conditions in the mine. Some mines may be able to get high grade, durable timber which will last five to ten years, but with a great many of them two or three years is the average. Where the air is dry timber will last longer than where it is damp. Timbers with a large percentage of heartwood will last longer than sap timber. Timber which has started to decay while in storage will rot much quicker than timber which has received proper care.

Perhaps the simplest way in which the life of mine timber can be increased is by peeling. Bark retards seasoning and tends to keep the timber damp. It also harbors insects which weaken the timber by their activities and open passageways which favor the rapid progress of decay. It has been demonstrated in actual tests in a mine that peeled timber was appreciably more durable than similar timber with the bark on.

The surest way to increase the life of timber to the maximum is by the use of wood preservatives. The preservative treatment of wood has been practiced in this country and in Europe for nearly 100 years. During this time many materials have been used and many methods tried, and out of this wealth of experience a few preservatives and methods have come to be con-

sidered as standards, while the majority have fallen by the wayside.

Of all the preservatives which have been used in this country, coal tar creosote and zinc chloride are most generally accepted and most widely used. Both of these preservatives have demonstrated their effectiveness by innumerable tests, and today there are literally millions of pieces of timber in use which have been treated with one or the other of them.

The most effective way to apply wood preservatives is by means of pressure. This permits better penetration of the preservative and thus better protection to the wood than is likely to be obtained by any other process. Pressure treating equipment is relatively expensive and only those mines which have large quantities of timber to treat can afford it. Pressure treated mine ties and timbers may be purchased from commercial treating companies in some localities. If it is practicable by any means for a mine to secure pressure treated timber, this is strongly recommended.

Where pressure treatment is impractical, simpler and less expensive treatments are available. The best non-pressure treatment is the hot and cold bath open tank process which is carried out by immersing the timber first in a bath of hot preservative for one or more hours, and then in a bath of cool preservative for the same or a longer time. With the right kind of timber, peeled and properly seasoned, preservatives can be made to penetrate very satisfactorily by this simple process, and very effective protection can be obtained.

No one can be expected to go to the trouble of using preservatives unless he can be shown that it pays. This is easy to do. The Forest Service has been conducting experiments for many years in various mines, and it has been clearly demonstrated that at a relatively low cost the life of the timbers can be greatly increased. In one mine where untreated timber lasts about two years treated timbers have been in service for fourteen years and many of them are still sound. This treatment added but 10 or 15 per cent to the cost of the timber in place, but increased its life by 600 per cent. In other mines, where the untreated timber does not decay quite so rapidly, the savings have still been very great. Well treated mine timbers can reasonably be expected to resist decay from twelve to twenty years.

To summarize briefly, preservative treatment of mine timbers increases durability, saves labor and expense in timber maintenance, reduces delays and loss due to timber repairs and renewals, reduces fire hazard and danger of accidents, and makes the timber supply last longer. Preservatives and processes suitable for every mine are available and their use is strongly recommended.

REPORT OF COMMITTEE ON METAL MINE ACCOUNTING

The organization of this Committee was not completed until July, 1921, about which time the work was gotten under way.

The Committee in entering upon its work recognizes that the object of its labor is to formulate a system of accounts that, if followed, would show the true operating profit and costs and the actual condition of the business at the end of each period. Also, it realizes that any standard of accounts and costs that may be recommended should meet the demands of the Treasury Department governing the determination of income for the purpose of Federal Taxes wherever it is possible to do so without depreciating the value of the accounting and cost data to the operating organization.

The work of the committee has been partially completed, and therefore, at this time, we can make only a progress report.

In making a general survey of the subject, the committee decided that it would be necessary to group the metal mines producing ores and metals of a radically different character and to meet the requirements of each group. Therefore, the metal mines were divided into the following groups.

1. Base Non-ferrous Mines,
2. Ferrous Mines,
3. Precious Metal Mines, and
4. Rare Metal Mines.

The working out of a Standard Accounting and Cost System for Base Non-ferrous Mines has been partly finished. It is hoped to finish this in the future and to take up the requirements of the other groups. It is believed that the only changes that will be necessary for the other groups will be in the detail accounts, and that at least a standard Profit and Loss Statement and Balance Sheet will be obtained for all metal mines.

To facilitate the work of the committee, the subject has been divided into seven sections, as follows:

1. Disbursements, Asset and Expense Accounts.
2. Production and Production Revenue Accounts.
3. Capital and Capital Revenue Accounts.
4. Depreciation, Obsolescence, Depletion and Losses.
5. Profit and Loss, Dividends and Surplus.
6. Balance Sheet.
7. Costs.

Each section is being taken up separately and decisions made to meet the requirements of the Base Non-ferrous Metal Mines. Accounts, properly named, and Costs, that will meet the require-

ments of the metal mines as well as the demands of the Treasury Department, are being worked out upon a unit basis so as to allow of sufficient expansion if desired in the detail accounts and costs to accommodate the needs of each unit of the industry.

It is probably not necessary to mention the benefits that would accrue from the results furnished by a complete, up-to-date and uniform system of accounts and costs for metal mines, especially at this time when most of the metal mines are being operated either at a loss or on a small margin of profit, and every item of expense is closely analyzed and every means of reducing costs is being tried.

The managers and executives of metal mines are well aware that to properly manage the business, there must be complete and correct records, properly and uniformly compiled, showing the results of operations for each period in such manner as to meet the demands of the Federal and State Laws and of employees, as well as the needs of the business.

Since the enactment of the present Federal Tax Laws requiring complete and uniform accounting and cost data, efforts have been made by most of the metal mines to complete and standardize their accounts and costs, as far as the needs of each individual business demanded. However, as the accounting and cost systems of a large number of metal mines originated during the development stage, or at a time when large profits were being obtained, and when the keeping of complete records were considered more or less unnecessary, the initial accounting system was not always established upon the correct basis. As the business grew and the need became apparent for more accounting and cost data, as a rule, the accounting system was not revised and rebuilt on correct principles, but instead, additions or modifications were introduced to obtain the additional data with the least disturbance of the original methods.

As a result, the Managers of some of the metal mines are burdened with an accounting and cost system that is incomplete or out of harmony with the operations, or is expensive to operate and slow to give results to the operating staff. Therefore, in some instances the accounting and cost methods in use are as much out of date and as inefficient as would be a mill or smelter if operated with the equipment and methods in vogue, say, ten or fifteen years ago.

In other words, accounting methods, accounts and costs have not, as a whole kept pace with the development in organization, equipment and operating methods, the efforts being made "to put new wine in old bottles."

While most of the large metal mines have developed complete systems of accounts and costs, the data obtained, in many instances, is compiled in such a manner as to be of no value to anyone not familiar with the system used. An operating head upon leaving the employ of one mine and entering the organization of another mine may find that he must familiarize himself with operating statements of costs, etc., compiled upon a different basis and in a different manner.

The lack of uniformity, disregard for correct principles and the forcing of new data through old channels and into antiquated forms has resulted in a certain amount of apathy in the minds of the operating department heads for accounting and cost data to the detriment of the business. Also there has resulted in the workmen suspicion as to the motives and veracity of the managers and owners of mine properties, and exaggerated ideas as to the profits of mines, especially in the minds of those composing the taxing bodies.

The Cost Sheet in the hands of the operating man is his compass and if it be defective it is not probable that the port of the greatest possible profit will be reached.

It is the desire of the Committee to work out the following fundamentals: First, a Standard of Asset, Expense and Revenue Accounts that will provide for the proper charges and credits to Capital and to Operating Expense and Revenue, etc., and allow of the determination of production costs in a uniform manner by all metal mines; second, a Standard Profit and Loss Account, or Income Statement, that will clearly show the net profits for each period of operation in a uniform manner for each and every unit of the industry; third, a Standard Form of Balance Sheet, uniformly grouped and arranged so that the condition of the business can be quickly and accurately ascertained and compared with every other unit of the industry; fourth, a certain method of procedure in the determining of Operating Costs for each unit of the metal mining industry so that an operating head of any department of one metal mine may compare his costs with the costs obtained in a like department by other mines and know that the costs were obtained in a like manner.

As in Production the object is to keep the product moving forward in as direct a line as practicable with the least expenditure of money and time, so in Accounting the object is to keep the operating and business data from each department moving in as direct a line as possible to the Accounting and Cost Departments and there to be assembled into the proper form to be

of the greatest value and to pass on to the manager and executives, and to return in part to the head of each department, with the least expenditure of time and money. The value of the Accounting and Costs to each individual unit depends upon three things: First, the correctness of the original data; second, the proper assembling of the data, and, third, the time in which the assembled results are delivered to the operating heads. The value of the assembled data of one unit to other units of the industry, to the government, to the stockholders, and to the general public depends upon uniformity.

The Committee is desirous of obtaining complete lists of Accounts used by the different metal mines together with forms of Profit and Loss Account and Balance Sheets and methods of determining Operating and Production Costs. Such data have been received already from a number of the metal mines, but contributions by other mines would be appreciated. Also, the committee is open for suggestions that anyone may wish to make to obtain the proper compiling and presenting the Accounts and Costs in a uniform manner.

Signed by T. O. McGRATH, Chairman.

(Following is a brief discussion of the Progress Report of the Committee on Metal Mine Accounting, October 18, 1921, Acting General Chairman William B. Daly presiding:)

MR. McGRATH: I wish to say that the work of this committee, the same as a great number of others, is only in a state of progress, our committee not having been completely organized until July of this year.

Our hope is to at least place a profit and loss statement before you for each mine, and show you what all mines in which you are interested are doing in net results, taking the balance sheet the same way, and seeing what condition in each mine compares with similar conditions in your mine, etc. We know we can do that. We also hope to get a system of costs, so if you are working in one mine you can know that your costs when obtained were obtained in the same way they were in another mine.

In the Tax Section, this afternoon, there was brought out the great difficulty of the government with tax matters, and it was stated that one of the great difficulties was the lack of uniformity and the lack of data. The 1917 and 1918 statements have not all been checked, and that is one of the great drawbacks. They can't get at the facts. One of the reasons is because the mines have not had uniform costs, and each mine has its own system of keeping its own record. Very few mines kept complete records prior to the tax laws. They figured that as a kind of unnecessary evil; therefore, they had no more of it than was necessary. But now you must keep those records complete, whether you want to or not. The more uniform they are, the better it will be for you and the greater benefit it will be to your other units operating around you, as well as a help to the government.

For instance, in Bisbee three different systems of accounts are kept by three different mines. Every once in a while they get together and

try to compare their drifting costs, their stoping costs, etc., and they vary quite a bit; they commence analyzing and find out one company figured track men and pipe men in total number of employees by which footage was divided, another figured repairs on stopes and counted these men in, while a third company did not, and so on. Their costs, therefore, are absolutely useless for comparative purposes. The consequent result is they show practically no interest in one another's costs.

I think you will realize that this doesn't produce very good results. We had a case regarding the construction of a new power plant. Our general manager asked the master mechanic why he couldn't obtain better costs with his power plant, at least equal to those of another company that had well kept costs. He replied: "Well, if we kept our costs like they do we would have the same costs." That is the way they generally settle the argument of costs. It is all due to lack of uniformity.

CHAIRMAN DALY: I think I can add to Mr. McGrath's statement that the same thing prevails in practically every mining district in the country: every mining company figures different items in its cost sheets, and they are therefore of no avail at all for comparative purposes. Uniformity in costs, I think, is of the utmost importance from the viewpoint of standardization.

PROGRESS REPORT OF COMMITTEE ON UNDERGROUND TRANSPORTATION

A questionnaire, as hereinafter fully set forth, was mailed to every member of this committee, with a request that the questions contained therein be answered and forwarded to the chairman for compilation.

This questionnaire, to date, has been answered by ten companies, as follows:

Bunker Hill & Sullivan Mining & S. Co.; Compania Real del Monte; Moctezuma Copper Company, Cananea Consolidated Copper Co.; Anaconda Copper Company; The Arizona Copper Company; Copper Queen Branch, Phelps Dodge Corporation; Miami Copper Company; Calumet & Arizona Copper Company; Inspiration Con. Copper Co.

The following pages contain the original questions, together with a compilation of the replies received.

QUESTIONNAIRE

Q. 1. What are the various forms of haulage employed in your mine?

ANSWERS:

Company
No.

1. (a) Hand Tramming. (b) Motor Haulage. (electric trolley), (c) Motor Haulage (storage battery).
2. Hand tramming and storage battery locomotives.

3. (a) Hand tramming, (b) electric haulage (trolley type), (c) electric haulage (storage battery type).
4. The Cananea Consolidated Copper Company, S. A., uses hand tramming, mule haulage and motor haulage (electric, trolley type) in their mines.
5. 20 mines use hand haulage, 13 mines use mule haulage, 16 mines use trolley type motor haulage and 7 mines use storage battery type motor haulage.
6. Hand tramming, mule and electric haulage.
7. Motor, mule and hand.
8. Electric trolley, storage battery motor—very small tonnage.
9. Hand tramming, mule haulage and motor haulage (electric).
10. Compressed air locomotives for ore; electric trolley for waste.

Q. 2. What percentage of all ore and waste is handled by each form?

ANSWERS:

1. Hand tramming, ore, 9.7 per cent; waste, 4.1 per cent. Storage battery, ore, 90.3 per cent; waste, 58.4 per cent. Trolley motor, ore, .0 per cent; waste, 37.5 per cent. The ore handled out of Kellogg tunnel adit is 100 per cent trolley motor.
2. Hand tramming, 66 per cent; storage battery locomotives, 34 per cent.
3. Daily output hand trammed, 81 per cent; daily output motor trammed (trolley), 87 per cent.

   Overlapping of percentage due to the fact ore and waste are often handled twice. Note: Storage battery locomotive installed this year; doing excellent work; will gradually replace trolley haulage.
4. The percentage of material handled by each of the above systems is approximately as follows: Electric motor, 40 per cent; hand tramming, 55 per cent, and mule tramming, 5 per cent.
5. Hand tramming, 11 per cent; mule tramming, 17 per cent; trolley motor, 56 per cent; storage battery, 16 per cent.
6. Hand tramming (transfers to chutes only), 90 per cent; mule tramming (transfers to chutes only), 10 per cent. The main haulage is 100 per cent trolley type motor.
7. Hand tramming, 30 per cent; mule tramming, 10 per cent; trolley type motor, 80 per cent.

   The overlapping in percentages is caused by handling some ore twice.
8. All ore down raises to main haulage level is trammed by hand, where electric haulage, trolley type, removes it. Storage battery tramming, too small to consider.
9. Hand tramming, 5 per cent; mule tramming, 30 per cent; motor haulage, 65 per cent.
10. Compressed air locomotives, 100 per cent ore; trolley, 100 per cent waste.

Q. 3. What different types of hand tramming cars do you use?

ANSWERS:

1. There are three styles of hand tramming cars, side dump, and dump and scoop cars.

2. See photostat of dwg. H-2-457.* (This drawing is attached to his report, which is also attached to this report and made a part thereof.)
3. Side dump. See Blue Print marked C; Watt end dump, see Blue Print marked D; end dump with swivel converted into side dump. (These drawings are attached to his report, which is also attached to this report and made a part hereof.)
4. All hand tramming cars are of the revolving end-dump style.
5. 29 mines use Anaconda No. 1 and No. 2 cars; 1 mine uses Davis-Daly special, similar to Anaconda No. 2. (The drawings for these cars may be obtained by writing to Mr. Norris.)
6. End-dump, revolving and gable-bottom, side-dump.
7. V—Rocker side-dump, square swivel side or end-dump, square side-dump.
8. Box—end-dump.
9. Only one type, revolving end-dump—iron box.
10. No hand tramming.

Q. 4. How many of each kind?

ANSWERS:

1. There are five scoop cars, 10 side-dump and 6 end-dump.
2. 66 with 20 cu. ft. body; 188 with 24 cu. ft. body.
3. (a) 2 side-dump (this car is to replace the end-dump); (b) 144 Watt end-dump; (c) 4 converted side-dump.
4. There are about 600 in use.
5. 6,337 Anaconda No. 2 cars are in use for hand hauling; 350 Anaconda No. 1 cars are in use for hand hauling; 158 Davis Daly special cars in use for hand hauling.
6. 275 end-dump, revolving; 20 gable bottom, side dump.
7. 500 Sw. dump, 300 V. R. dump, 200 side-dump.
8. 70 box end-dump.
9. 625 revolving end-dump—iron box.
10. No hand tramming.

Q. 5. Give cubic feet capacity of each kind.

ANSWERS:

1. 5 scoop cars, capacity 12 cu. ft.; 10 cars side-dump, capacity 20 cu. ft.; 5 cars end-dump, capacity 30 cu. ft.; 1 car end-dump, capacity 20 cu. ft.
2. 20 cu. ft. and 24 cu. ft.
3. All hand tram cars 22 cu ft.
4. Their measured capacity is 16 cu. ft.
5. Anaconda No. 1 cars have 16 cu. ft. capacity; Anaconda No. 2 cars have 14 cu. ft. capacity; Davis Daly special cars have 14 cu. ft. capacity.
6. 275 End-dump, revolving; 20 gable bottom, side dump. 40 cu. ft. capacity.
7. Sw. dump 12 cu. ft., V. R. D. 15 cu ft., side-dump 15 cu. ft.
8. 20 cu. ft = 1 ton; 30 cu ft. = 1½ tons; Box end-dump.
9. 16 cu. ft.
10. No hand tramming.

*This and other illustrations mentioned in this report were not furnished by this committee.

Q. 6. Which of the above cars are roller bearing?

ANSWERS:

1. The scoop cars, five of the 20-ft. side-dump cars, and one 20-ft. end-dump car are babbitt bearing; five 30-ft. end-dump and five 20-ft. side-dump are roller bearing.
2. All.
3. All.
4. About 20 per cent are Anaconda type axles, and the balance are roller bearing.
5. 2,872 roller bearing cars are in use.
6. All.
7. All. Hyatt.
8. All.
9. None.
10. None.

Q. 7. If guards are provided for hands and fingers of trammers when pushing cars describe them.

ANSWERS:

1. A bar is provided at the rear of the car near the top that can be grasped by the hands, which eliminates the danger of crushing the hands between the drift and the car.
2. None provided.
3. None provided.
4. No special hand guards are provided.
5. None of these cars are provided with guards.
6. None provided.
7. None provided.
8. (Not answered.)
9. None provided.
10. None.

Q. 8. What gauge of track is used for above cars?

ANSWERS:

1. 24-inch gauge is used.
2. 19¾ inches (50 cmts.).
3. 20-inch gauge.
4. Gauge of track for above cars is 18 inches.
5. 3 mines use 20-inch gauge track, 22 mines use 18-inch gauge track.
6. 20-inch gauge.
7. 20 inches.
8. 18 inches.
9. 18-inch gauge.
10. None.

Q. 9. What weight of rail?

ANSWERS:

1. A 16-lb. rail is used.

2. 16 lbs. per yard.
3. 16-lb. rails.
4. Standard rail is 16 lbs.
5. 18 mines use 12-lb. rails, 6 mines use 16-lb. rails, 1 mine uses 25-lb. rails.
6. Weight of rails, 16 lbs.
7. 16 lbs.
8. 16 lbs.
9. 12-lb. rail,
10. None for hand tramming.

Q. 10. What is size and spacing of ties? (That is, how far apart are ties laid?)

ANSWERS:

1. The ties are 4″x6″x4′ and are spaced as needed, usually about one foot.
2. 4″x5″x40″, spaced 24″, ties are heavy and long enough to carry 25-lb. rail when latter is laid for motor haulage.
3. 4″x4″ ties, 24″ spacing.
4. Ties are 4″x6″ and spaces 18″ apart.
5. 16 mines use 3″x10″x30″ ties, 6 mines use 4″x10″x30″ ties, 2 mines use 4″x10″ runners, 1 mine uses 5″x7″x48″ ties, 2 mines use 20″ spacing, 13 mines use 30″ spacing, 3 mines use 36″ spacing, 4 mines use 42″ spacing, 1 mine uses 5′4″ spacing.
6. Size and spacing of ties, 3″x6″ and 4″x6″, spaced 30″ centers.
7. 4″x4″x3′, 15″ spacing.
8. 4″x8″x2′6″, spaced 18″ to 24″.
9. 4″x4″x30″ or 4″x6″x30″, spaced 3 feet apart.
10. About 15″ space.

Q. 11. What per cent grade is standard for all hand tramming drifts?

ANSWERS:

1. The standard grade for all hand tramming drifts is one-half of one per cent in favor of the trammer.
2. .75 per cent
3. .5 per cent maximum grade.
4. For hand tramming tracks are given a grade of 8 inches to the hundred feet, or 0.65 per cent.
5. 1 mine has 0.41 per cent grade, 15 mines have 0.43 per cent grade, 3 mines have 0.50 per cent grade, 4 mines have 0.62 per cent grade, 1 mine has 0.83 per cent grade, 1 mine has 0.66 per cent grade.
6. 0.4 per cent in favor of load where practical, otherwise level.
7. 0.5 per cent.
8. Level.
9. ½ of 1 per cent.
10. No hand tramming.

Q. 12. Give dimensions of hand tramming drifts in the clear.

ANSWERS:

1. Drifts are 5′x7′.
2. 7′ high by 7′ wide.
3. 5′x7′.

4. Drifts intended for hand tramming are 7′ high and 6′ wide.
5. 18 mines have dimensions of 4′6″x7′3″ in the clear; 2 mines have dimensions of 5′x7′ in the clear; 1 mine has dimensions of 6′x8′ in the clear; 1 mine uses battered sets 3′6″x7′x5′ in the clear; 1 mine uses battered sets 4′x5′x7′ in the clear; 1 mine uses battered sets 4′x6′x6′6″ in the clear; 1 mine uses battered sets 4′6″x7′x7′6″ in the clear.
6. Dimensions of hand tramming drifts, 4′6″x6′6″ in the clear.
7. 5′x8′.
8. See small blue print, ¾″x1′. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. 5′x7′.

Q. 13. What are the sizes and types of loading chutes?

ANSWERS:

1. The chutes are 3′x3′9″, built of heavy plank, with a slope of 30 degrees.
2. For shrink stopes see photostat of sketch; for cut and fill stopes same style of chute is used, but single instead of three close together, spaced 25 ft. to 30 ft. (This photostat is attached to his report, which is also attached to this report, and made a part thereof.)
3. Stope chutes are 9 post, including manway; drift chutes are 2 post. (See blue prints A and B attached. These blue prints are attached to his report, which is also attached to this report, and made a part thereof.)
4. Loading chutes for hand tramming are generally the ordinary square set chute 3 feet in width at the mouth and closed by two gate boards.
5. 2 mines use 22″x24″ size chutes; 5 mines use 24″x24″ size chutes; 1 mine uses 24″x20″ size chutes; 2 mines use 24″x30″ size chutes; 1 mine uses 26″x20″ size chutes; 1 mine uses 26″x16″ size chutes; 1 mine uses 26″x24″ size chutes; 1 mine uses 28″x20″ size chutes; 3 mines use 27″x20″ size chutes; 1 mine uses 30″x20″ size chutes; 1 mine uses 30″x22″ size chutes; 3 mines use 30″x30″ size chutes; 1 mine uses 33″x24″ size chutes; 1 mine uses 36″x18″ size chutes; 1 mine uses 36″x20″ size chutes.
6. (Blue print attached.) (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
7. 4′2″x4′5″, 6 post; 4′4″ square; 2 coup crib.
8. 2′-10″ inside. (See blue print.) (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. Practically only one size and type of loading chute is used. Print A-2-C 524 gives details. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
10. Chutes approx. 3′x3′, built of 3″ plank.

Q. 14. Give clearance between cars and chutes.

ANSWERS:

1. The clearance between cars and chutes is 6 inches.
2. Never less than 6 inches.
3. 13-inch clearance.
4. The standard clearance between chute mouth and small mine cars is 6 inches.

5. 3 mines have a clearance of 4 inches between cars and chutes; 7 mines have a clearance of 6 inches between cars and chutes; 6 mines have a clearance of 8 inches between cars and chutes; 2 mines have a clearance of 10 inches between cars and chutes; 3 mines have a clearance of 12 inches between cars and chutes; 2 mines have a clearance of 13½ inches between cars and chutes; 1 mine has a clearance of 15 inches between cars and chutes; 1 mine has a clearance of 18 inches between cars and chutes;
6. Blue print attached. 2-J-520. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
7. 6 inches.
8. See small blue print. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. Clearance from 6 inches to 8 inches.
10. Clearance from 6 inches to 12 inches.

Q. 15. Describe type, or types, of chute doors which are standard in your mines for all hand tramming drifts.

ANSWERS:

1. There are three plank gates which are staggered vertically.
2. See sketch. (This sketch is attached to his report, which is also attached to this report, and made a part thereof.)
3. The plain 2x12 board door has been found most economical. (See blue prints marked A and B attached. (These blue prints are attached to his report, which is also attached to this report, and made a part thereof.)
4. Answered in No. 13.
5. 5 mines use iron doors, operated by lever; 3 mines use iron stoppers; 16 mines use wooden stop boards; 1 mine uses iron and wood stop boards.
6. Blue print attached. A-J-520. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
7. Iron arc hand level control and wooden gravity doors. See Bulletin No. 6, Volume 3. (This bulletin is attached to his report, which is also attached to this report, and made a part thereof.)
8. Stopper board. See blue print. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. Chute doors in hand tramming drifts are wooden plank, as shown in print A-2C-254. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)

MOTOR HAULAGE (Electric—Trolley Type)

Q. 16. If electric haulage, with trolley type is the principal form, give number of electric motors, weight of each, and make.

ANSWERS:

1. There are 11 trolley locomotives, as follows: (a) General Electric, 8,000 lbs., 1,000 lbs. draw bar pull; (b) General Electric, 9,000 lbs., 1,200 lbs. draw bar pull; (c) General Electric, 10,000 lbs., 1,200 lbs. draw bar pull; (d) Bunker Hill and Sullivan, 10,500 lbs., 1,200 lbs. draw bar pull; (e) General Electric, 13,700 lbs., 2,800 lbs. draw bar pull; (f) Jeffrey Co., 11,656 lbs., 2,400 lbs. draw bar pull; (g) Jeffrey Co., 5,000 lbs.; (h) General Electric, 14,000 lbs.; 3,000 lbs. draw bar

pull; (i) General Electric, 16,280 lbs., 3,200 lbs. draw bar pull; (j) General Electric, 16,400 lbs., 4,000 lbs. draw bar pull; (k) General Electric, 14,000 lbs., 3,000 lbs. draw bar pull.

2. No trolley type locomotives are used underground; two installations are used to haul ore to mill through tunnels from surface.
3. 400 level 3 Goodman locomotives, 6,000 lbs.; 600 level 1 Westinghouse, 8,000 lbs.; 800 level 1 Westinghouse, 8,000 lbs.; 1,000 level 2 Westinghouse, 8,000 lbs.; 700 level 4 General Electric, 20,000 lbs.; surface 1 Westinghouse, 9,000 lbs.; surface 1 Baldwin, 8,000 lbs.
4. The electric locomotives in use here at present are: 5 4-ton Jeffrey; 2 4½-ton Baldwin-Westinghouse, and 3 10-ton Jeffrey; 10 in all.
5. 17 mines have a total of 143 electric locomotives. 3 mines have 17 Jeffreys, weight 3½ tons; 17 mines have 102 Westinghouse-Baldwin, weight 3½ tons; 8 mines have 24 General Electric, weight 3½ tons.
6. 23 6-ton units, type D. M., class 30, Jeffrey locomotives; direct current, 250 volts.
   These are combined in sets of 2 or 3 units, as service requires.
7. 18 2-7½ tons, 6 6-tons, 2-7½ tons, Westinghouse motor; others Goodman.
8. 10 6-ton Goodman, single motor locomotive, type M. 5-60.
9. 10 electric locomotives, Westinghouse, skeleton frame, 3½ tons, single end, double motor.
   These motors have proved to be very satisfactory.
10. 3 Westinghouse trolley locomotives (2-2½ tons and 1-2 tons).

Q. 17. Give height of trolley wire from rail, and voltage of wire.

ANSWERS:

1. The trolley is 6 feet 5¾ inches from the rail and has a voltage of 500 volts.
2. No trolley type locomotives are used underground.
3. 8 feet, voltage 250.
4. The standard height for trolley wire is 7 feet above the rail, and 260 volts are carried.
5. 16 mines have a height from rail to trolley wire 6 feet 9 inches, voltage 250; 1 mine has a height from rail to trolley wire 9 feet, voltage 250.
6. Height of trolley wire from rail 7 feet 6 inches; voltage of wire 250 D.C.
7. 7 feet, 250 volts.
8. 7 feet 10 inches, 220 volts.
9. Height of trolley wire from rail 7 feet 3 inches; voltage, 250 volts.
10. Wire is 7 feet no inches above rail and voltage is 440 D.C.

Q. 18. Is any provision made for protection from electric wires at loading chutes, and, in general, throughout the mine? Outline the various measures used.

ANSWERS:

1. At the main loading chute the trolley is about 8 feet above the rail, which puts it out of reach of the workmen. At other chutes an inverted wooden trough is placed over the wire to guard against contact with it.
2. No trolley type locomotives are used underground.
3. Opposite loading chutes trolley wires are elevated to between 10 and 11 feet above rail. In some cases a 2x12 frame is erected between trolley and chute.

4. At chutes, protection to loaders is given by the usual 1x6 board shields on both sides of the wire.
5. All trolley wires are enclosed on three sides by wooden boxes.
6. Protection from electric wires at loading chutes and elsewhere: (a) Trolley wires carried under loading chute platforms. (b) Lights at loading chutes. (c) Sectional insulators and switches at convenient point, to cut off current for protection of repairmen.

   For details see accompanying blue print 3-M-17. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
7. Cutout used in line with By Pass. Wire raised to 8 feet 6 inches over chute.
8. See large blue print of standard chute and drift set showing boxing as guard. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. Wire is protected throughout the mine by two timber guards of 1 inch by 6 inch material, spaced 6 inches apart—one on each side of wire. Top of guard is at height of wire. Some years ago the trolley wire at chutes was covered by a swinging door hinged to the trolley guard, at time of loading for same. At the present time the trolley wire is entirely removed from in front of the chute set while loading and the exposed ends covered by swinging board. This is accomplished by using a section of ¼-inch rod and also a section of ½-inch pipe as trolley wire. The pipe is electrically connected to the trolley wire. When a chute is to be loaded, the rod slides into the ½-inch pipe by sliding back a movable section of trolley guard, which is fastened to one end of the rod. As the trolley guard and rod clears the sides of the adjoining caps, a swinging board about 1 inch by 8 inches by 12 inches covers the end of the exposed wire. When this cut-out is open the current is carried past the gap by an insulated wire at the side of the drift. The above scheme has proved to be very satisfactory. It is very easy to operate and permits considerable more head room above the cars at the chutes.
10. No trolley wire at loading chutes.

Q. 19. How many different types of haulage cars are used? What are they?

ANSWERS:

1. There are three types of the haulage car for electric trolley locomotives, each weighing 2,472 lbs., bottom dump with a hopper bottom. (a) The ordinary babbitt bearing car. (b) The roller bearing car with springs. (c) The roller bearing car without springs.
2. No trolley type locomotives are used underground.
3. (a) "Hoya" or round bottom car, side-dump, with trunnion at each end. (b) Automatic side-dump waste cars. (c) 30-ton cars on 700 level.
4. Three different types of haulage cars are used here, a 2-ton capacity saddle-back car, a 4-ton capacity saddle-back car, and a 6-ton capacity hopper bottom car.
5. 1 mine uses No. 1 Anaconda cars, 1 mine uses No. 1 and No .2 Anaconda cars, 15 mines use No. 2 Anaconda cars.
6. Gable bottom, side dumping.
7. One. Rocker side-dump.
8. Gable bottom, side-dump.
9. Only one type of car, a saddle-back, holding about 3 tons of sulphide, is used. See print A-2-C-408. (This print is attached to

his report, which is also attached to this report, and made a part thereof.)

10. Only one type.

Q. 20. How many of each kind?

ANSWERS:

1. (a) 38 babbitt bearing cars; (b) 39 roller bearing cars with springs; (c) 6 roller bearing cars without springs.
2. No trolley type locomotives are used underground.
3. (a) 80 Hoyas; (b) 11 5-ton waste cars; (c) 45 30-ton cars.
4. There are about 60 of the 2-ton cars, 40 of the 4-ton type, and 30 of the 6-ton type.
5. 4,445 No. 2 Anaconda cars are in use; 684 No. 1 Anaconda cars are in use.
6. (a) 40 10-ton cars, equipped with automatic air brakes, journal bearings and M.C.B. couplings; (b) 99 5½-ton cars; (c) 9 4½-ton cars; (d) 41 3½-ton cars.
7. 800.
8. 200.
9. 128 cars.
10. No answer.

Q. 21. Give cubic feet capacity of each kind.

ANSWERS:

1. All cars have a capacity of 46.4 cubic feet.
2. No trolley type locomotives are used underground.
3. (a) Hoyas, 33 cubic feet; (b) side-dump waste cars, 90 cubic feet; (c) 30-ton cars, 600 cubic feet.
4. The 2-ton saddle-back car has a measured capacity of about 35 cubic feet; the 4-ton saddle-back car about 65 cubic feet, and the 6-ton hopper bottom car about 110 cubic feet.
5. Anaconda No. 2 cars have 14 cubic feet capacity; Anaconda No. 1 cars have 16 cubic feet capacity.
6. (a) 10 tons, 200 cubic feet; (b) 5½ tons, 108 cubic feet; (c) 4½ tons, 90 cubic feet; (d) 3½ tons, 70 cubic feet.
7. 33 cubic feet, 19 cubic feet, 15 cubic feet.
8. 66⅔ cubic feet.
9. 38 cubic feet.
10. Not answered.

Q. 22. How many cars and tons are pulled by the average train?

ANSWERS:

1. The average train has 17 cars, with a load of 50 to 55 tons.
2. No trolley-type locomotives are used underground.
3. (a) Goodman, 5 cars, 7½ tons.
   (b) Westinghouse, 10 cars, 15 tons.
4. The usual train is made up of 10 or 12 cars. The different sized cars are used at different mines under different conditions of service and are handled by locomotives to match.
5. 7 mines pull 10 cars, 7.0 tons; 1 mine pulls 9 cars, 7.2 tons; 1 mine pulls 10 cars, 8.0 tons; 2 mines pull 12 cars, 8.4 tons; 1 mine pulls 12 cars, 10.0 tons; 4 mines pull 15 cars, 10.5 tons; 1 mine pulls 18 cars, 10.8 tons.

6. (a) 30 10-ton cars, 300 tons (underground haulage); (b) other sizes, from 6 to 20 cars per train, depending upon requirements; used for short haul transfers, developments, etc.
7. 15 to 60 tons.
8. 20 to 30 cars, or 66⅔ and 100 tons.
9. On long hauls over straight track, with only few curves, 16 cars (50 tons) constitute a train. On short hauls (up to 2,000 ft.), over considerable number of curves, 10 cars constitute a train. The motors will handle more, but maximum efficiency is reached in hauling train as outlined above.
10. Not answered.

Q. 23. How long has this form of haulage been in use?

ANSWERS:

1. This form of haulage has been in use since 1903.
2. No trolley-type locomotives are used underground.
3. About 12 years.
4. This form of haulage has been in use here for the past 10 or 12 years.
5. This form of haulage has been in use for 14 years.
6. (a) With smaller cars, about 15 years; (b) with 10-ton cars, about 7 years.
7. 13 years.
8. 10 years.
9. Since 1914.
10. 6 years.

Q. 24. Motor Haulage (Storage Battery Locomotives). Are storage battery locomotives used for main haulage, or only for gathering motors to make up trips for large motors on main lines?

ANSWERS:

1. Storage battery motors are used only as gathering motors to bring ore from stopes to shaft pockets.
2. For main haulage in two of the large mines; small tonnage mines are hand tramming only.
3. Will be used below 1,000 level for both main haulage and gathering.
4. There are no storage battery locomotives in these mines.
5. 7 mines use storage battery locomotives for main haulage.
6. None.
7. Not answered.
8. For very light work, mainly on development on haulage level where electric wire has not been strung. Tonnage too small to consider.
9. Not answered.
10. None.

Q. 25. If storage battery locomotives are used, give number of locomotives, weight and make of each.

ANSWERS:

1. The Bunker Hill & Sullivan has six storage battery motors, as follows: (a) Jeffrey Co. 2½-ton, (b) Westinghouse-Baldwin 3½-ton, (c) General Electric 4-ton, (d) Westinghouse-Baldwin 4½-ton, (e) General Electric 2½-ton, (f) Jeffrey Co. 4½-ton.
2. 11 in use at present, more being installed. General Electric, 5-ton, type L. S. B., class 2-C-5.

3. Jeffrey, 8,000 lbs. (on 1,200 level).
4. (Not answered.)
5. 7 mines have a total of 41 storage battery locomotives; 2 mines have 2 Baldwin-Westinghouse, weight 5½ tons; 5 mines have 19 General Electric, weight 5½ tons; 1 mine has 9 Jeffreys, weight 4 tons; 1 mine has 11 Westinghouse-Baldwin, weight 4¼ tons.
6. None.
7. (Not answered.)
8. 1 4-ton storage battery motor, Jeffrey Mfg. Co., No. 3753, type BEM, class 20; Edison cell battery, type 86.-.87.
9. (Not answered.)
10. None.

Q. 26. .How long can storage battery locomotives operate without recharging?

ANSWERS:

1. Storage battery locomotives can be used for about 8 hours without recharging. Use two sets of batteries for each motor. One is being charged while other is in use.
2. 7 to 8 hours.
3. 8 hours.
4. (Not answered.)
5. Can operate 8 hours without recharging.
6. None.
7. (Not answered.)
8. About 12 hours. Booster charge generally given while idle.
9. (Not answered.)
10. None.

Q. 27. How many different types of haulage cars are used with this type of locomotive? What are they?

ANSWERS:

1. There is one type of car used. It is a bottom dump with a hopper bottom, similar to the car on the main electric trolley haulage, except that it is smaller. These cars are both roller and babbitt bearing.
2. One, see photostat of dwg. H-397. (This photostat is attached to his report, which is also attached to this report, and made a part thereof.)
3. (a) Side dump 22 cu. ft., same as hand tramming. Equipped with hooks and chain; (b) Hoyas; (c) some hand tram end dump cars are being used temporarily.
4. (Not answered.)
5. No. 1 and No. 2 Anaconda cars are used with this locomotive.
6. None.
7. (Not answered.)
8. Gable bottom, side dump; 3⅓ tons.
9. (Not answered.)
10. None.

Q. 28. How many of each kind?

ANSWERS:

1. There are 68 cars with roller bearings and 6 cars with babbitt bearing.

2. 90 cars in use.
3. (a) 2 side dump; (b) 80 Hoyas; (c) 30 end dump.
4. (Not answered.)
5. 2,397 No. 2 Anaconda cars; 350 No. 1 Anaconda cars.
6. None.
7. (Not answered.)
8. Train variable, depending on work. 4 to 6 cars.
9. (Not answered.)
10. None.

Q. 29. Give cubic feet capacity of each kind.

ANSWERS:

1. These cars have a capacity of 34 cu. ft.
2. 51 cu. ft.
3. (a) 22 cu. ft. side dump, (b) 33 cu. ft. Hoyas, (c) 22 cu. ft. end dump.
4. (Not answered.)
5. Anaconda No. 2 cars have 14-cu. ft. capacity, Anaconda No. 1 cars have 16-cu. ft. capacity.
6. None.
7. (Not answered.)
8. 66⅔ cu. ft.
9. (Not answered.)
10. None.

Q. 30. How many cars and tons are pulled by the average train?

ANSWERS:

1. The average train has 8 cars with a load of about 17 tons.
2. 7 cars, 16.1 metric tons of ore plus 1.2 tons weight of each car—16.1 plus 1.2x7=24.5 metric tons=54,000 lbs.
3. 12 cars, 12 tons.
4. (Not answered.)
5. 1 mine pulls 8 cars, 5.6 tons; 3 mines pull 10 cars, 7.0 tons; 1 mine pulls 12 cars, 7.5 tons; 1 mine pulls 12 cars, 10.0 tons; 1 mine pulls 15 cars, 10.5 tons.
6. None.
7. (Not answered.)
8. 4 to 6 cars.
9. (Not answered.)
10. None.

Q. 31. How long has this form of haulage been in use?

ANSWERS:

1. Storage battery motor haulage has been in use since March 3, 1913.
2. About 15 months.
3. Two months.
4. (Not answered.)
5. This form of haulage has been in use 8 years.
6. None.
7. (Not answered.)
8. 4 to 5 years.

9. (Not answered.)
10. None.

Q. 32. Give reasons why the use of storage battery locomotives is advantageous in your mines.

ANSWERS:

1. Storage battery motors can advance into drifts and tunnels as fast as rails can be laid. They obviate the necessity of bonding the rails and installing the trolley, and the added expense of removing the trolley should the drift be abandoned. It can assist itself if derailed. Since it carries a voltage of only 8-100 volts, the maintenance of the controller system is much reduced. The absence of the 500 volts trolley wire eliminates danger of contact due to low drifts and chutes projecting into the drift. In repairs, timbering and in changes of timbering or general layout the trolley wire and accessories must be moved and changed at great expense and annoyance, and constitutes an ever-present danger to all workingmen, but especially to the uninformed and careless.
2. Eliminates danger from trolley wire in front of chutes and can reach isolated parts of mine, such as drifts, cross-cuts and small stopes where installation of trolley would not pay.
3. Can be used on development and production for haulage and gathering. Can operate in smaller, hence cheaper, drives. Very heavy trolley installation and upkeep expense is eliminated.
4. (Not answered.)
5. Safety and cost of upkeep.
6. None.
7. (Not answered.)
8. None, except to help out prior to main trolley work.
9. (Not answered.)
10. None.

Q. 33. How does the cost of haulage by storage battery locomotives compare with the electric trolley system?

ANSWERS:

1. Storage battery motor is about 30 per cent higher than trolley haulage.
2. Have no means of comparison.
3. Has not been installed long enough to give figures.
4. None.
5. (Not answered.)
6. None.
7. (Not answered.)
8. Really no comparison as it is a negligible quantity.
9. (Not answered.)
10. None.

MOTOR HAULAGE (Compressed Air Locomotive)

Q. 34. If the Compressed Air System is used, give number and weight of Locomotives, also makes.

ANSWERS:

1. Not used in Bunker Hill & Sullivan mine.
2. Has no installation.

3. No compressed air locomotives at this mine.
4. There are no compressed air locomotives used here.
5. (Not answered.)
6. None.
7. (Not answered.)
8. Not used.
9. (Not answered.)
10. Fourteen 10 ton, 2 Stage Porter air locomotives, carrying 800 lbs. pressure throttled down to 200 pounds for high pressure cylinder.

Q. 35. How long can motors be used without recharging?

ANSWERS:

1. (Not answered.)
2. Have no installation.
3. Have no installation.
4. Have no installation.
5. (Not answered.)
6. None.
7. (Not answered.)
8. (Not answered.)
9. (Not answered.)
10. One locomotive hauls twenty loaded 5 ton cars (100 tons) down .4% grade 3000 feet and push empties back on one charge of air.

Q. 36. How many different types of haulage cars are used with this type of locomotive? What are they?

ANSWER:

No. 10 only. 20 five ton cars.

Q. 37. How many of each kind?

ANSWER:

No. 10 only. 350 cars.

Q. 38. Give cubic foot capacity of each kind.

ANSWER:

No. 10 only. 106 cubic foot capacity.

Q. 39. How many cars and tons are pulled by the average train?

ANSWER:

No. 10 only. 20 cars to a train.

Q. 40. How long has this system of haulage been in use?

ANSWERS:

1. Not used in Bunker Hill & Sullivan mine.
2. Have no installation.
3. No compressed air locomotives at this mine.
4. There are no compressed air locomotives used here.
5. (Not answered.)
6. None.
7. (Not answered.)

8. Not used.
9. (Not answered.)
10. Six years.

IN GENERAL

Q. 41. Give gauge of track, weight of rail, size and spacing of times for all motor drifts.

ANSWERS:

1. The electric trolley haulage track is of 24″ gauge with 50 lb. rails and is furnished with 6″x8″x4′ ties spaced as needed. The storage battery motor tracks are of 24″ gauge with 30 lb. rails and are furnished with 4″x6″x3′ ties, spaced as needed, but usually about one ft.
2. 19¾″ (50 cmts.) 25 lb. rail 4″x5″x40″, spaced 24 in.
3. All levels except 700-20″ gauge—16 and 25 lb. rails, 4″x6″ ties 18″ apart.
4. The track over which we handle the 6-ton cars is laid with 50 lb. rails; the gauge of this track is 38″ and the ties are 8″x8″ and laid 20 in. apart. In all other motor drifts the rails are 35 lb., gauge of track is 18 in. and ties are 6x8 and spaced 24″ apart.
5. 18 mines have 18″ gauge track for all motor drifts and 25 lb. rails; 3 mines have 20″ gauge track for all motor drifts and 25 lb. rails; 1 mine uses 3″x6″x30″ ties; 2 mines use 3″x8″x30″ ties; 6 mines use 3″x10″x30″ ties; 5 mines use 4″x10″x30″ ties; 1 mine uses 5″x7″x34″ ties; 3 mines use 5″x10″x30″ ties; 1 mine uses 6″x10″x30″ ties; 2 mines use runners 4″x10″; 1 mine spaces ties 18″; 2 mines space ties 20″; 1 mine spaces ties 2′; 7 mines space ties 20″; 2 mines space ties 32″; 4 mines space ties 36″; 1 mine spaces ties 48″; 1 mine spaces ties 60″; 2 mines space ties 42″.
6. Gauge of track 20″; weight of rails 48 lbs. for heavy haulage; 25 lbs. to 35 lbs. for light haulage; size of ties 6″x8″, 4′ long; spacing of ties 20″ to 24″, center to center.
7. 20″ gauge; 25 and 40 pound; 4″x6″x3′6″ ties, 15″ centers, also 5x8 3′5″ ties.
8. 24″; 30 lbs. now 45 lbs.; 4″x8″x3′6″; 18″.
9. Gauge 18 inch; 25 lb. rail; ties 4x6″-36″ long, spaced 24″ apart; at switches larger ties are used.
10. Gauge 30″, rails 40 lbs., ties 6″x8″ spaced every 2 feet.

Q. 42. What per cent grade is standard for haulage drifts?

ANSWERS:

1. One half of one per cent grade in favor of the motor is the standard for all motor drifts.
2. 0.75%.
3. Not to exceed .5%.
4. The standard grade for all motor tracks is 6 in. to the hundred feet, or 0.50%.
5. 1 mine has 0.32% grade; 11 mines have 0.43% grade; 3 mines have 0.50% grade; 1 mine has 0.52% grade; 3 mines have 0.62% grade; 1 mine has 0.66% grade; 1 mine has 0.83% grade.
6. 0.4% in favor of the load.
7. 0.5%.
8. 0.5%.
9. Standard 0.5%. Some drifts are run on .25%.
10. .4% in favor of loads.

Q. 43. Give dimensions of all haulage drifts in the clear.

ANSWERS:

1. The electric trolley haulage tunnel is 8′ wide by 7′ high, in the clear. The storage battery drifts are 5′ wide by 7′ high, in the clear.
2. 7′ high by 7′ wide.
3. 5½′x8½′.
4. Haulage drifts for 38″ track are 8′ wide and 9′ high; and for 18″ track they are 7′ wide and 8′ high.
5. 15 mines have haulage drifts 4′6″x7′3″ in clear; 1 mine has haulage drifts 5′0″x7′3″ in clear; 1 mine has haulage drifts 5′0″x7′6″ in clear; 1 mine uses battered sets 4′x6′x7′; 1 mine uses battered sets 4′6″x7′6″x7′ in clear; 1 mine uses battered sets 4′x8′x7′7″; 1 mine has haulage drifts 9′0″x10′0″ in clear. (See text.)
6. Dimensions of haulage drifts, 8′x8′ in the clear.
7. 5½′x8½′.
8. See large B.P. (This blue print is attached to his report, which is also attached to this report and made a part thereof.)
9. Motor haulage-ways 5′x6½′. Motor drifts 5½′x8′.
10. Haulage drifts 7′6″ in clear from cap to base of rail.

Q. 44. What provision is made for drainage in all drifts?

ANSWERS:

1. A ditch is left at one side of the track for the water on the lower levels to run to the sump of the pump, where it is delivered to the main haulage tunnel and runs to the outside by means of a ditch next to the track.
2. Drain on one side of track.
3. Ditches.
4. There is so little water in these mines that shallow ditches, sometimes cemented, are sufficient.
5. 16 mines have ditch in center of drift.
   14 mines have ditch in side of drift.
6. Drainage of drifts,—concrete ditches where necessary.
7. Drainage ditch 6″x12″—side of drift where needed.
8. Ditch to one side.
9. In ground which might possibly be wet, ditches are carried at side of drift while same is advancing. In isolated wet spots water is piped through raises to lower wet levels.
10. A boxed gutter is carried on one side of drift.

Q. 45. Are there electric lights in all haulage ways? How far apart are lights distributed, and are there lights over all switches?

ANSWERS:

1. There are lights in all haulage ways. On the storage battery haulage ways they are distributed as needed, as on the main haulage way they are 50 ft. apart. All switches are provided with electric lights.
2. Only in main drifts, spaced 35 ft. to 40 ft.; yes.
3. No. There are lights at all dumps and at principal loading chutes, but not spaced in haulage ways. There are lights on some, but not all, switches.
4. There are electric lights in all haulage ways, with lights over all switches, at all chutes, and 100 ft. apart elsewhere.

5. 23 mines have electric lights in haulage drifts.
   9 mines have lights 100 ft. apart.
   5 mines have lights 50 ft. apart.
   1 mine has lights 15 ft. apart.
   2 mines have lights 75 ft. apart.
   4 mines have lights 60 ft. apart.
   1 mine has lights 150 ft. apart.
   21 mines have lights over switches.
6. Electric lights are placed at all switches and manway safety stations, and generally distributed about 100 ft. apart along the drifts.
7. Yes; 100 ft.; yes.
8. Yes; about 150 to 200 ft.
9. All haulage ways are electric lighted. Lights are placed over all switches. On Main line motor drifts lights are spaced about 100 ft. apart; on branch lines from 100 to 200 ft. apart; on curves lights are spaced at closer intervals.
10. Haulage drifts have electric lights spaced 100 feet apart and lights are also placed over switches.

Q. 46. Is a general signal system used? If so, give brief description.

ANSWERS:

1. A block system is used on the main haulage tunnel. Trains coming in are indicated by green and have the right of way until the motor man of that train throws the light off. Trains going out are indicated by red lights and have the right of way until the motorman of that train throws the lights off. Provision is made for the use of these block signals at four different places on the main haulage way.
2. No.
3. No.
4. It has not yet been necessary to install a general signal system, because the work here is spread over such a wide territory that it has been possible so far for each motor crew to operate independently.
5. 5 mines have block signal system.
6. Colored lights are attached to all switches to indicate the position of the switch; for train protection there is a block-signal semaphore system, operated by the trolley circuit, connected through the locomotive pantograph to a signal wire paralleling the trolley wire.
7. Yes; block system.
8. Red lights at switches on main line. Switch closed on entry, flares, red light. Open on way out cuts off light. Simple.
9. No general signal system used. On curves where travel is in both directions over a single track, a block signal consisting of a red light and Klaxon horn, operated by the flange of car wheel passing over a switch plate, announces the passing over a given point by a train, giving warning to other trains and persons using same section of drift. On branch lines a manually operated switch operates a light at the main track switch, which announces the presence of a motor on that track. In addition the general lighting system is used as a flash system over whole sections of track from certain central points.
10. Yes; block signal system, like that of most railroads.

Q. 47. Is any special ballast used for road beds in haulage drifts? If so, give brief description of same.

ANSWERS:

1. No special ballast.
2. No.
3. No.

4. No special ballast is used for road beds.
5. No special ballast is used for road beds.
6. No special ballast is used for road beds.
7. Slag and broken quartsite in drifts through aluminous formation.
8. No special ballast.
9. General ballast used is material cut in drifts.
10. Ballast is ordinary mine rock.

Q. 48. Which of the cars used for motor haulage are roller bearing?

ANSWERS:

1. Most of the cars are roller bearing.
2. All.
3. All.
4. Roller bearings are used on the 4-ton and 6-ton cars.
5. 2,772 cars are roller bearing.
6. None of the cars used for motor haulage have roller bearings; all motor haulage cars have journal bearing.
7. All.
8. All.
9. None.
10. No roller bearings used on ore cars.

Q. 49. Are brakes of any kind used on motor haulage cars? If so, describe them.

ANSWERS:

1. No brakes are provided on the cars, the train being controlled by the brakes on the motor.
2. Yes, see drawing H-397. (This drawing is attached to his report, which is also attached to this report, and made a part thereof.)
3. No, except on 30-ton R.R. cars, which use Westinghouse air brakes.
4. Brakes have not been found necessary on these grades.
5. No brakes used, but motor is kept at head of loaded train.
6. Some 5½-ton cars are equipped with hand brakes; 10-ton cars are equipped with automatic air brakes.
7. No.
8. No.
9. No.
10. No.

Q. 50. Give reasons why your present haulage system has been adopted for your conditions.

ANSWERS:

1. The main haulage way is two miles long and is, therefore, too great for compressed air locomotives, and they would not be efficient; gasoline locomotives would contaminate the air.
2. See answer 32.
3. We have always used trolley haulage on alternate levels and hand tramming between, but for reasons stated in No. 32, storage battery haulage will replace trolley on alternate levels below 700 level, which handles our full tonnage out of the mine, and which will continue to use trolley haulage.

4. With so many different mines, each with its peculiar transportation problems, it has been found necessary to use all three haulage systems and sometimes combinations thereof to meet local conditions economically.
5. (Not answered.)
6. The extent of the system required, the length of the haul, and the large tonnage to be moved, were considerations which led to the adoption of the electric trolley system. The 20" track gauge was adopted to conform with that already in use in the mines and laid upon the surface. The use of one gauge for hand and motor tramming, manifestly, is an advantage.
7. Wet aluminous ore requires special equipment for haulage and dumping. Hence the adoption of the Rocker dump cars. Swelling ground in haulage drifts makes heavy upkeep to tracks.
8. Easy to dump cars; train never broken when unloading; always in motion unloading; power; reasonable cost; motors and cars easily repaired.
9. Our haulage system was adopted to replace mule haulage at a period when the mine was fairly well developed. Ore bodies in the Warren District are rather small, irregular, and are scattered over a large area, necessitating a large amount of drifting and raising in comparison to the ore mined. Motor haulage is confined to the areas producing a large tonnage of ore, but is extended as new producing areas are brought in. At time motor system was adopted we possessed a full complement of 16 cubic feet cars, 18 inch gauge. For this reason we use the same gauge (18 inch) for motor and mule haulage. Small hand cars of waste are handled by the motors to some extent.
10. Air haulage was chosen rather than electric because it was thought to be safer and they are more convenient as gathering locomotives.

Q. 51. What are the sizes and types of loading chutes for motor haulage drifts?

ANSWERS:

1. All chutes have a 30-degree pitch. On the main haulage way they are 2 feet 6 inches wide by 3 feet high. On all other drifts they are 3 feet by 3 feet 9 inches.
2. See sketch and answer 13. For loading from bins or transfer chutes, where no big rocks can get through by grizzlies being used, an arc gate is used. See photostat of drawing F-2-336. (Sketch and photostat are attached to his report, which is also attached to this report, and made a part thereof.)
3. See blue prints attached, marked "E" for 700 level, and "A-B" for other levels. (These blue prints are attached to his report, which are also attached to this report, and made a part thereof.)
4. The loading chutes for motor haulage are usually built in the ordinary sill floor square set. The timbers are two sets high to permit building the chute at the proper height. The upper set provides a convenient place for the loader to work.
5. 2 mines have 22"x24" wooden chutes; 8 mines have 24"x24" wooden chutes; 1 mine has 24"x30" wooden chutes; 2 mines have 26"x24" wooden chutes; 1 mine has 26"x20" wooden chutes; 2 mines have 27"x20" wooden chutes; 1 mine has 30"x24" wooden chutes; 1 mine has 30"x30" wooden chutes; 1 mine has 32"x22" wooden chutes; 1 mine has 33"x24" wooden chutes; 1 mine has 36"x20" wooden chutes.

   Note: 22"x24" means chute mouth, 22" wide and 24" high.

6. See blue print attached (3-M-17). (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
7. Same as hand tram.
8. See arc gate on large blue print. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. See print A-2-A-224. (This print is attached to his report, which is also attached to this report and made a part thereof.)
10. Loading chutes are made of 2″x12″ boards. Chutes 30 inches wide, and slope 40 degrees.

Q. 52. Give clearance between motor cars and chutes.

ANSWERS:

1. There is a clearance of 8 inches between the chute and the cars on the main tunnel and a clearance of 6 inches on all other drifts.
2. Never less than 6 inches.
3. 13 inches.
4. The standard clearance for motor chutes is 16 inches.
5. 2 mines have a clearance of 4″.
   7 mines have a clearance of 6″.
   6 mines have a clearance of 8″.
   1 mine has a clearance of 10″.
   2 mines have a clearance of 12″.
   1 mine has a clearance of 13½″.
   1 mine has a clearance of 15″.
6. Clearance between motor cars and chutes, 16½ in.
7. 6 in. to 9 in.
8. See blue print. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. 8 in. clearance between lip of chute and car.
10. Clearance between motor and chute is nine inches, and between cars and chute is 16 inches.

Q. 53. Are end, or side dump, cars used in hand tramming? In motor tramming?

ANSWERS:

1. Both side-dump and end-dump cars are used in hand tramming. but only bottom dump cars in motor tramming.
2. See drawings. (These drawings are attached to his report, which is also attached to this report, and made a part thereof.)
3. Hand tramming, both end and side, are used, but a standard 22 cu. ft. side dump is being designed for both hand and motor haulage.
4. For hand tramming, end dump cars are used. Motor cars are either gable bottom side dumping, or hopper bottomed and center dumping.
5. All cars are end dump.
6. Answered in Par. 3 and 19.
7. Both—side dump.
8. End dump; side dump.
9. End dump in hand tramming; in motor tramming, side dump.
10. No hand tramming. Tiffle used for motor cars.

Q. 54. Describe type, or types, of chute doors, which are standard in your motor haulage drifts.

ANSWERS:

1. On the main haulage tunnel-chutes, the chute gate is a convex piece of sheet iron with the convex side toward the ore. This is provided with a long handle and is pivoted near the middle. By pushing down on the handle the gate is opened and vice versa. All other chutes have gates consisting of three individual planks staggered vertically.
2. See sketch. (This sketch is attached to his report, which is also attached to this report, and made a part thereof.)
3. See blue prints attached, marked "E" for 700 level, and "A" and "B" for other levels. (These blue prints are attached to his report, which is also attached to this report, and made a part thereof.)
4. The doors on motor chutes are iron arc gates, lever operated.
5. 6 mines have iron doors operated by lever; 1 mine has iron stop boards; 5 mines have iron and wood stop boards; 8 mines have wooden stop boards.
6. Arc chute doors, standard for all haulage chutes. For details see accompanying blue print No. 3-M-17. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
7. See Practical Mining Course, No. 6, Vol. 3. (This book is attached to his report, which is also attached to this report, and made a part thereof.)
8. Arc gates. See blue print. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. Most satisfactory chute door is an iron door having a removable pipe handle which operator opens from platform on opposite side of drift. Bottom of chute is provided with an apron to divert flow of ore to center of car. This apron is hinged so that it may be removed from drift after car is loaded. Print A-2-A-224 gives general details. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
10. Arc chute gates are used. They are made of steel plate, bent in an arc 24 inches long and radius of 24 inches. One end has a bar bent to be used as a handle.

SUGGESTIONS FOR STANDARDS

Q. 55. What would be your idea of a standard size and type of car for all hand tramming in your mine—handling the hard, sticky and fine material, both ore and waste?

ANSWERS:

1. A roller-bearing, box-shaped, end-dump, 20-foot car.
2. We have no very sticky ore, except in one small mine, and find our type of car quite suitable.
3. All stoping and development in this mine is done by contract, with a fixed price per ton for labor and explosives. This necessitates an accurate measure of ore. We find that we lose out with any section of car with the top larger than the bottom, as the car could appear full, but would be only heaped up in the middle with an empty space around the perimeter of the car. We, therefore, favor a car which gives us one full ton of ore or waste, and for this purpose the 22 cubic feet side-dump car has been adopted for both hand and motor haulage, except on the main Porvenir or 700-level tunnel, in which 30-ton cars are used for hauling the total production to the concentrator.

4. We have not been able to decide upon a standard car for all classes of ore. Our Rocker dump cars are too high for efficient mucking from drifts. Have found a 20 cubic feet car with a box 2x2½x4 feet, 40 inches in height, to be very satisfactory for hand tramming where ore is hoisted in cars.
5. The revolving end-dump car, equipped with roller bearings, and of about 16 cubic feet capacity, has been satisfactory for hand tramming.
6. Present type cannot be changed to advantage.
7. Our end-dump revolving cars of 20 cubic feet capacity are standard in our mines. We have practically no sticky ore. The overall dimensions of the box are 4 feet long by 2½ feet wide by 2 feet high. These cars should be roller bearing and have some kind of device for protecting the hands of the trammers, but to date we have not found anything suitable that the men themselves will always use.
8. Box, 20 cubic feet, end-dump, roller bearing.
9. Motors of our hand trammed cars are loaded by hand from the face of crosscuts. The material shoveled varies from limestone to pyrite. An ideal car must be able to hold the maximum amount of our lighter material (limestone), which can be trammed most efficiently and also be low enough not to impair the efficiency of the mucker when handling pyrite or sulphide ore. (Cars of sulphide are only loaded about three-quarters full.) Such a car is about a 15 cubic feet car, with the top about 42 inches above the rail, iron box revolving on trucks, end-dump, with door fitting tightly (for fine material). We have only a very small amount of sticky material and, hence, do not have to consider that in our tramming problem.
10. No answer.

Q. 56. What would be your suggestion regarding a standard car for all motor haulage (giving dimensions, height of car, tonnage capacity, etc.)?

ANSWERS:

1. A car 6 feet 6 inches long, 3 feet 4 inches wide and 4 feet 2 inches high, weighing about 2,500 lbs. and having a capacity of 46 cubic feet and a tonnage capacity of 3 tons. This car should be provided with springs and roller bearings. For assembly cars, it should carry at least 34½ cubic feet. The Bunker Hill car is 3 feet by 5 feet and 3 feet 6 inches high.
2. See drawing H-397. This car being same height and wheels same gauge as hand car, both motor haulage and hand tramming can be done from same chutes. (This drawing is attached to his report, which is also attached to this report, and made a part thereof.)
3. See 55 for dimensions; see blue prints No. A-B-52. (These blue prints are attached to his report, which is also attached to this report, and made a part thereof.)
4. It would be difficult to standardize satisfactorily. A 2-ton car is handy to shovel into and can be moved by the usual mucking crew in a drift; the 4 and 6-ton cars are preferable when handling ore from chutes.
5. A larger car would be of great advantage in ore handling, but would not fit with our drift and shaft conditions.
6. We are of the opinion that two standard sizes of motor cars should be used under our conditions, viz.: (a) For the bulk of our heavy hauling of ore to the hoisting shaft, 10-ton cars, shown in outline or blue print. (b) For development drifts and for transferring ore on upper levels of mines to motor chutes, 5½-ton cars. Both these cars are of the same general design and differ only in size.

7. For our conditions the 33 cubic feet Rocker dump car is very suitable, but I cannot recommend it except for special conditions.
8. This entirely depends on power cost, method of handling trammed ore, state laws with regard to trolley wires, and tonnage required.
9. A standard car for motor haulage will vary with the type of our deposit, tonnage mined and length of haul. Under the conditions in the Warren District, where the amortization on each mile of motor drift is high, the cars should be of a size so as to fit the most economical size of motor drift. As these cars are filled from motor chutes, the height is only limited by the clearance between top of the ore and the trolley wire, taking also into consideration the clearance of chutes. Another fact to be considered is cost of unloading ore at the pockets. A saddle-back car requires less labor and attention than probably any other car in unloading sticky ores or hard ores (with the exception of cars dumped by tipple). My idea of a standard motor car is a saddle-back, about 40 to 50 cubic feet capacity, after the general type of car shown in print A-2-C-408. (This print is attached to his report, which is also attached to this report, and made a part thereof.)
10. No answer.

Q. 57. What is your idea regarding a standard gauge of track, weight of rail, per cent of grade for drift, and dimensions of drift, for all hand tramming?

ANSWERS:

1. A 24-inch gauge track, with 30-lb. rails, and a grade of one-half of one per cent in favor of the trammer. The drift should be at least 5 by 7 feet.
2. Should be same as for hand tramming, except weight of rail.
3. Standard gauge, 20 inches; weight of rail, 16 lbs.; grade .5 per cent, drift, 5 by 7 feet.
4. For hand tramming, the drift should be 7 feet high and 6 feet wide. The track should be 16-lb. rail laid on a 0.65 per cent grade and to an 18-inch gauge.
5. 18-inch gauge, 12-lb. rail, 0.43 per cent grade. 4′6″x7′3″.
6. 20-inch gauge, 16-lb. rails, level grade and 5′x7′ drifts, generally untimbered.
7. 18-inch or 20-inch gauge, 12-lb. to 14-lb. or 16-lb. rail; ½ per cent grade (4.5′x7′ drift).
8. 18-inch, 16-lb. rail; clearance 15 inches to 16 inches. Method mining, spacing of chutes control grade.
9. For hand tramming 18 inches is a satisfactory gauge. Weight of rail 12 lbs. to 16 lbs. Grade one-half of one per cent. Size of drift about 5 feet by 7 feet.
10. No answer.

Q. 58. What is your idea regarding a standard gauge of track, weight of rail, per cent of grade of drift, and dimensions of drift in the clear, for all motor haulage.

ANSWERS:

1. A 24-inch gauge track, 50-lb. rail for electric trolley motor haulage and 30-lb. rail for storage motor haulage, with one-fourth of one per cent grade in all cases. This is to be in favor of the motor. Dimensions of drift in the clear should be 8 feet by 7 feet.
2. Should be the same as for hand tramming, except weight of rail.
3. Same as 57.

4. For motor haulage, it is more difficult to generalize; heavy tonnages in long hauls require different equipment from that used for more general mining.
5. 20-inch gauge, 25-lb. rail, .50 per cent grade. 5′0″x7′3″.
6. (a) For main motor haulage to shaft with 10-ton cars, 20-inch gauge, 48-lb. rails; (b) 0.4 per cent in favor of load, 8 feet by 8 feet in clear.
7. Depends entirely upon tonnage to be produced. One-half per cent grade is more suitable grade for driving a drift.
8. 30 inches, 45 lbs., 0.5 per cent, 18-inch clearance.
9. Standards for motor haulage track will vary with size of cars and motors to use same. For general mine use under conditions similar to those in Bisbee, I think a 5 or 6-ton motor is about the correct size. Track should be 22 to 24 inches, gauge weight of rail from 25 to 45 lbs., and grade about .35 per cent. Drift should be 6 by 8 feet in the clear.
10. It may be possible to reduce the number of track gauges, sizes of rail, etc., that are used at present, but not possible to make all of them the same.

Q. 59. What would be your idea of a standard chute, chute door, and clearance between chute and car, also guards on cars, for all hand tramming drifts?

ANSWERS:

1. A 3′x3′9″ chute with a 30-degree pitch and a plank gate staggered vertically. There should be a clearance of 6 inches between the chute and the cars. Rods should be provided at the rear of the car for the hands.
2. Our type of chute and chute door as per sketch (see answer 13) are cheaply built and work satisfactorily. Iron arc and side gates of different types have been tried out, but are expensive and are damaged by blasting big rocks. Never less than 6-inch clearance is allowed. Owing to sufficient clearance, have never found them necessary.
3. For cut and fill stopes drawing A.D.-61 represents our idea of standard chute and chute door for hand tramming drifts and motor tramming drifts on all levels except the 700 level. Clearance between chute and car should be 13 inches.
4. For hand tramming ore from chutes, the standard chute in a sill floor set with two gate boards and drip board is satisfactory.
5. Wooden chutes, 24″x24″ mouth, wooden stoppers, 12-inch clearance between top of car and chute mouth.
6. See blue print 2-J-520. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
7. C. Q.—Standard chute.
8. See small blue print on hand tramming. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
9. For standard chute (hand tramming) I recommend one similar to that shown on print A-2-C-524. Clearance between chute and car should be 6 inches.
10. No comments, as we have no hand tramming.

Q. 60. What would be your idea of a standard chute, chute door, and clearance between chute and car, for all motor haulage drifts?

ANSWERS:

1. For assembly drifts there should be 3'x3'9" chutes with a 30-degree pitch and a plank gate staggered vertically. There should be a clearance of at least 6 inches between the chute and the cars. On the main haulage tunnel the chute should be 2'6"x3' and should clear the car by 8 inches.
2. See answer 59, also answer 51.
3. Same as 59.
4. For motor haulage, the chute described in No. 51 and No. 54 is as good as any.
5. Wooden chute, 24"x24"; iron door with lever or wooden stoppers. 12-inch clearance.
6. See blue print 3-M-17. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
7. C. Q. Standard chute with stronger construction.
8. In questions 56, 57 and 60 it is very hard to specify any definite standard, especially in the larger producing properties, as innumerable features are to be considered with regard to the mining method. The method will control car. These features come under mine methods and timbering. I believe these subjects should be left to the discretion of the Manager and Superintendent, as mining methods are too variable to really specify any particular size of drift, car or chute.
9. The size of chute door will vary with weight and character of material to be drawn out. The door and chute shown in print A-2-A-224 has proved to be very satisfactory for our ores. I believe this general design will make a good standard for all motor haulage drifts. (This blue print is attached to his report, which is also attached to this report, and made a part thereof.)
10. Answers to questions 51, 52 and 54 give our standards which we developed after considerable experimenting.

Q. 61. What is your idea regarding a standard weight of locomotive for use in your mine?

ANSWERS:

1. A 4½-ton locomotive for assembling ore and an 8-ton to 10-ton locomotive for main haulage.
2. We tried first a 3-ton locomotive with trailer battery, but found it too slow and light. We think our present type (see answer 25) to be good, owing to its size and ability to go anywhere a hand propelled car can go, which a heavier and larger locomotive could not do.
3. 5-ton storage battery locomotive.
4. Except for unusually heavy duty, a 6-ton locomotive seems preferable.
5. 3½ to 5½ tons.
6. Our standard is 6½ tons for unit, which is a maximum for 20-inch gauge.
7. 3 tons and 7½ tons.
8. The locomotive which we use is very satisfactory. 6-ton.
9. Our motors (3½-ton) are a little light for our work, but are the largest size that will operate on 18-inch gauge. About a 6-ton locomotive would be about the proper size, I think.
10. 10 tons.

Signed by WILLIAM B. DALY, Chairman.

DISCUSSION OF PROGRESS REPORT OF COMMITTEE ON UNDERGROUND TRANSPORTATION

CHAIRMAN WILLIAM B. DALY PRESIDING

After a general discussion of the Progress Report, Chairman Daly suggested that, in regard to the standardization of mine cars, a motion be made to indicate the general views of those present as regards: First, "the size of car in cubic capacity, taking into account the average specific gravity of the ore or waste to be moved, and the number of cars to a train"; second, "the economical size of a motor to pull that load over a grade (to be established), and which would permit that motive power to pull the same train of empties back on that grade," adding that "this would really standardize the entire motor haulage."

This question, which is at present under discussion by Mr. Daly's Committee, was then discussed pro and con, but inasmuch as it involves so many fundamentals, and the time of the meeting being too brief for such an extensive subject, it was not possible to arrive at any definite decision.

It was, however, the consensus of opinion of those present that an 18-inch to 20-inch gauge, .5 per cent grade, and 16-lb. rail, would meet the requirements for a standard for a medium size drift—say, 5 feet by 7 feet, for hand tramming.

JOINT METAL AND COAL MINING BRANCHES

THURSDAY EVENING, OCTOBER 21, 1921

The meeting, devoted to the subject of Standardization, was called to order at eight-thirty by Colonel Warren R. Roberts, Chairman.

CHAIRMAN ROBERTS: We must first apologize to our audience for delaying the opening of this meeting for half an hour, but we believe that the importance of the subjects to be discussed were worthy of a real audience. We brought men here from New York and Washington to address you on what we consider very important topics, and we hoped by delaying our meeting until about the time people usually go to the theatre, we would have a better audience. Before we begin our regular program, our Secretary has some resolutions to present.

SECRETARY CALLBREATH: I want to announce that at the meeting of members this afternoon, the following gentlemen were elected as directors to serve for three years:

Bulkeley Wells, Denver.
E. L. Doheny, Los Angeles.
Sidney Jennings, New York.
H. W. Seaman, Chicago.

I might say that our Board of Directors consists of twelve members. The effort is made always to have them distributed as nearly geographically as possible to cover the nation and at the same time so as to represent as nearly as may be the different branches of the mining industry.

I want to read, as the by-laws require, a few resolutions as presented.

Secretary Callbreath read Resolution No. 8, presented by Mr. A. G. McGregor; Resolution No. 9, recommending that the increase in freight rates on railroads be abolished; Resolution No. 10, introduced by the Tariff Conference; Resolution No. 11, on Americanization; Resolution No. 12, by the Tariff Conference.

CHAIRMAN ROBERTS: You will notice, by referring to your programs, that this is the Fifth General Session of our Convention, and through the courtesy and the generosity of our convention management, the session is to be devoted to Standardization.

As an introduction to the subjects which the speakers will discuss this evening, I think a word of explanation as to our understanding of the meaning of standardization would not be out of place.

As I remember, the motto of the American Mining Congress is "Safety, Efficiency, Conservation." These are the ideals which the American Mining Congress has been striving to attain, since its organization. However, until the Standardization Division was organized, the American Mining Congress had no machinery set up exclusively to attain these ideals.

Standardization in its proper interpretation and application fulfills the ideals of the motto of the American Mining Congress.

You are all familiar with the meaning of the word "safety." We have had campaign after campaign to teach our people the great value of safety.

Efficiency is the watchword of our great industrial organizations. Therefore, you are all familiar with what efficiency means. It has doubtless been the greatest factor in creating our great industrial concerns.

Conservation is a very broad term often misunderstood and misused. It was first given national importance by the great American, Roosevelt, and since he made "conservation" popular with the American people it has had many followers.

Those are the three ideals of the American Mining Congress, and the Standardization Division is trying to realize those ideals for the mining industry

You will note, as the speakers of the evening come before you one by one, that they are all young men. There is an old motto: "Young men for war and old men for counsel." This is not exactly war, but it is a great campaign, and a campaign is a part of war, and this program tonight is a part of our campaign. We have, therefore, selected our young fighters, and I hope they will be as full of "pep" tonight as they have been in the past in helping to win other victories.

Some years ago there was a great article written entitled, "A Message *to* Garcia." I understand that that message has been translated into more languages and read by more people than any other document that was ever written. Tonight we are going to have a message *from* Hoover. I hope that this message will be as important to American industry as the message to Garcia.

The messenger who has been selected by Mr. Hoover to bring his greeting to the American Mining Congress and the people of Chicago is Mr. H. C. Morris, Chief of the Fuel Division of the Bureau of Foreign and Domestic Commerce. We will now hear the message.

CO-OPERATION OF THE DEPARTMENT OF COMMERCE WITH THE MINERAL INDUSTRY

MESSAGE FROM SECRETARY HERBERT A. HOOVER PRESENTED BY H. C. MORRIS

Mr. Chairman, Ladies and Gentlemen of the American Mining Congress: I bring you a message this evening from one of our own kind, whose broadness of vision and sureness of accomplishment have made of him not only a mining man of international repute, but also a humanitarian whom the whole world holds in affectionate regard and is proud to honor, the Secretary of Commerce, Herbert Hoover.

Mr. Hoover asked me to say to you that the Department of Commerce is charged, under act of Congress and by virtue of the desire of the Federal Government to be generally helpful, with the stimulation of the distribution of commodities. The mineral production of the United States is, therefore, a matter of keen interest to the Department and one in which it has the greatest anxiety to be of service.

The Department is *not* a regulatory Department, but a Department of service. Its functions, so far as they are developed, are largely in the direction of the promotion of foreign trade, the furnishing of statistical information both foreign and domestic, and the conduct of investigation work in the great physics laboratory of the Bureau of Standards.

Except for a few of the metals our export trade in mineral commodities is indeed badly disorganized, and it is with the purpose of assisting the industry to better this organization that we have reorganized the Bureau of Foreign and Domestic Commerce and installed in it a Fuel Division. We hope to be

able also to establish divisions to directly assist the business in other minerals.

It is the desire of the Department to co-operate with the great voluntary bodies of the industry in the development of this service, for the Department is endowed with agents in almost all quarters of the world and is able to develop facts with regard to supply and demand, and to assist the American exporter in the actual negotiations of his business.

Success in selling, whether at home or abroad, is founded upon an accurate gauging of buying ability; and that, in turn, must of necessity be based upon accurate and prompt information of general conditions in the market centers of the world, and upon specific conditions of competing foreign industries.

In statistical information the reorganization of the Bureau of the Census, to cover a wider field of live and current statistics, is of profound interest to the mineral industry; not only because that industry depends considerably upon the trend of other industries, but also because statistical information of consumption in the industry itself falls far short of satisfying the necessities of the business.

In the reorganization of the Bureau of Standards to include the wide theme of manufacturing standardization and simplification, the Department again comes into relationship with the mineral industry.

For all these reasons it is the keen desire of the Department that it should be brought into closest relationship for co-operation with the industry, and it seeks the appointment of a committee from your Congress, which will co-operate with the Department.

The mineral industry of this country should gain a position in the world's trade commensurate with the abundant resources of the United States. We must develop a spirit of mutual helpfulness and co-ordination of effort in order to meet the competition of organized commerce abroad, and with that purpose in view, I pledge you the full assistance of the Department of Commerce.

CHAIRMAN ROBERTS: I am sure that you will all support me in extending to Mr. Hoover through his messenger, our very hearty appreciation of his message to us, and that we will undertake immediate and careful consideration of the suggestions contained in his message.

We have heard a very great deal of late, much has been written and bills have been introduced into Congress with the object of trying to stabilize the coal industry, as they put it. There are many doctors offering a cure for the supposed ills of the coal industry, but no suggestion has been made to date and no bills have been introduced in Congress that seem to meet the requirements of this case of stabilizing the coal industry.

We are now going to have an address by Mr. C. E. Lesher, Managing Editor of "Coal Age," the greatest coal journal in America. He will speak on "Standardization as a Factor in Stabilization of the Coal Industry." (Applause.)

STANDARDIZATION AS A FACTOR IN STABILIZATION OF THE COAL INDUSTRY

BY C. E. LESHER

Mr. Chairman and Gentlemen: Intelligent conception and application of standardization spells progress. The narrow view means atrophy. Standardization must be viewed broadly, not as an effort to reduce all to a common denominator. The accepted creed of labor unionism that standardizes individual effort and initiative by setting maximum standards of performance is nothing short of vicious. No less vicious is any effort to set standards of profit in business, standards having no regard to service performed. Less than a year ago in an address before the American Economic Association at Atlantic City, Mr. George Cushing said that as the managing director of the American Wholesale Coal Association, probably better known to you as the coal jobbers, he had been studying the marketing of coal and in two years had got no further than to consider the advisability of having a fixed return to the jobber and that the figure then thought best was 50 cents per ton. That is not the kind of Standardization we want.

If instead of setting standards of maximum effort that prevent the rise of able men, strangle competition, and stifle initiative, the labor unions would standardize on minimum effort, they would be more in keeping with the spirit of our conception of social justice. A phrase as yet not satisfactorily defined is "The American Standard of Living." You may well conceive to where we would come were we to seriously consider that living conditions could actually be standardized, the same for every individual. Yet there are and should be, certain aspects of living conditions that are properly to be considered as subject to standardization. So it is with mining coal. We may properly fix upon the pitch or thread for a screw of given diameter, but we must not attempt to say that only screws of certain diameter must be used. Rails are quite properly manufactured in a series of weights per yard, but standardization in the use of rails that goes beyond the definition of the maximum moving load that should be carried on rails of each weight, is misapplied.

We may have the room and pillar system of mining as a standard form, but we must not attempt to define the width of all rooms, and the thickness of all pillars. Conditions at each mine and often in different parts of the same mine control these things. In other words, in the mechanical processes of mining it is the standardization of broad principles of methods and practices that we seek rather than narrow details. As I have watched the development of the program of the Standardization

Conference here this week I have been impressed with the sound reasoning that is back of its direction. Petty details are brushed aside and thought has been directed toward the big things. Mining engineering in the coal industry in this country has advanced far in the direction of use of machinery for the purpose, as Director Smith so aptly put it yesterday, of product increasing rather than narrowly, of labor saving. The high broad conception of standardization held by Col. Roberts, the chairman and guiding spirit of this movement in this Congress and Conference, is leading you in the direction of progress.

But standardization need not be confined to the mechanical and mining engineering aspects of coal. It has already taken a large part in your relations with labor. Wages are standardized. I think none, even the most partisan non-unionist, but will agree that the standardization of wages effected by the contract between the operators and the labor union through some 25 or 30 years of collective bargaining has benefited the coal industry. It has stabilized the industry; it has even in the past stabilized strikes, and put them in the even years and at a certain time in the spring. For these benefits, if for no other, and despite its failures, I never expect to see the abolishment of collective bargaining in the coal industry, though its form and animating spirit and program of nationalization must be greatly amended and changed.

It is perhaps significant of the fact that labor is the largest problem of the coal industry, that standardization has proceeded farther here than in any other aspect of the business. Contemplation of its application may help us to more clearly see where such a program will lead us in attempts at standardization in other directions. In the first place we find base rates that govern over all the producing fields, union, of course, and ultimately non-union as well. But the standard wage is not the wage for all. There follow differentials in fields, predicated on differences in underground and even on market conditions. Finally the standard wage is not applied to each mine and further than that, to each working place. Deficiencies command a bonus, unusually attractive working places attract the most efficient labor. Standardization of wage has been a great asset to the coal industry; it is only with the arbitrary attempts of the union to standardize individual effort and prevent progress that we have serious quarrels.

It is somewhat as if the manufacturers of machinery should organize a tight union and dictate to coal operators the kind of equipment they should use and also just how, when, and where, it should be used. They might in some instances improve on prevalent practice, but in the long run the result would be retrogression and increased cost, because such a course would be contrary to the priniciple of individual freedom and enterprise.

The largest undeveloped area in the coal industy in which

standardization is yet to play a substantial part is that of marketing, and it is here that lies the richest opportunity for stabilization of the industry. Fundamentally stabilization means leveling off the peaks in production and price and filling up the depressions. It means giving uniform employment to men and to capital engaged in the production and distribution of coal. In one branch of the industry, that of mining anthracite in Pennsylvania, that condition has been very closely approached. Steady price levels for the principal product of the hard coal mines and comparatively steady rates of production have been reached through standardization of product, that is by setting up definite sizes, and by standardization of prices. In neither quality, size or price is there positive uniformity, but the variations are minor as compared with those obtaining in the bituminous coal trade. The approach to uniformity has been sufficient, coupled with a standard method of merchandising, to produce for the anthracite industry a degree of stabilization that is the aim and ambition of the soft coal trade.

The inherent difference between the anthracite and bituminous coal industries make the approach for the latter more difficult than those confronting the hard coal operators in 1902, when they initiated the program that has been of such a benefit to them and the consuming public. Instead of a compact area with relatively few producers as with anthracite, bituminous coal is widely scattered, of greatly differing qualities and grades and in the hands of thousands instead of hundreds of producers. Instead of catering to but one primary trade, the household user, the bituminous is the fuel of all industry and transportation as well as of the home.

The first step in standardization of marketing relates to quality and preparation. The next is education of the buyer and consumer in these standards. An outstanding illustration of what can be done in this direction is found in the development and operation of the pools in the coal trade on the Atlantic seaboard.

In less than three years classification of eastern coal by pool number has become so well established as a feature of the trade that despite the fact that the exchange handling the business has been discontinued, the trade continuing to quote coal by pool number and the buyer continues to think in terms of coal by pool. Pool 1, for instance, has come to have a definite meaning as regards quality, a meaning accepted by seller and buyer alike. This simplified business in that coal. Producers of large tonnages with well established names are able to carry on without the organized assistance of such a system of standards and have therefore largely operated outside the voluntary tidewater coal exchanges, whereas to the smaller producer, the organization has been a great help in marketing.

The ultimate development in this direction is found in the form of exchange adopted by the shippers of coal on the Vir-

ginian Railway in the smokeless field of coal produced in their area, classified their product in terms of ash, sulphur, volatile matter and heat value and in their tidewater business are able and do guarantee the quality of each shipment. And because they collectively are able to give such guarantees there, operators have through this form of standardization, stabilized their market.

Not every field is so favored of Nature. However, as the smokeless of West Virginia, Central Pennsylvania, for instance, presents such a myriad of varieties of coal as defy such definiteness of classification. The answer here, of course, is to split up Central Pennsylvania into logical units of small producing areas and standardize the product from each district. Where the classification of coal in this area has so far failed is in not defining standards.

It has been proposed to classify all coal produced and to assign each mine to some class. It has even been proposed that the Federal government should inspect all coal shipped in interstate trade and give guarantee to the consumer, as it were, as to the quality of what he is buying. We may perhaps, some day come to this, for as the advocates of this proposal point out, other basic commodities, as wheat, are already so handled.

The fact that such a scheme finds advocates is evidence, not to be overlooked by the shipper of coal, of the need and desire on the part of the consumer of coal for some sort of standardization. Perhaps the most we can hope for in this respect over the greater part of the bituminous coal field is standardization of sizes. Standardization in quality is more difficult of approach because what is poor coal for one purpose may be the best coal for some other use. What is needed then is standardization of use, the determination of the kind of coal, taking into consideration both chemical analysis and physical properties, that is most suitable for each boiler plant and for each process. As may be expected the consumer is taking the lead in that direction, the National Association of Purchasing Agents only recently having taken up the question of standard specifications for the purchase of coal.

In the matter of contracts governing the purchase and sale of coal, there is great need for standardization. The crying need here is for a revolution that will make the coal contract a binding document. This result cannot be achieved simply through the process of drawing up a legal paper; it must come through a change in the method of selling coal. When the coal shipper is in position to bind himself to deliver under all and every circumstance the coal he sells, then he will be in position to require of the buyer a guarantee that he take under all conditions the coal that he has purchased. We cannot complain that this angle of coal marketing has not been standardized. On the

contrary the practice of holding a coal contract merely as an option to sell or buy is altogether too common.

Taking the broad view of standardization and the practical view of stabilization, the question may be summed up by saying that the possibilities of the one for bettering conditions in the coal industry are great enough to warrant their intensive study and application by all seeking the other.

CHAIRMAN ROBERTS: In preparing these programs for the Standardization Conference, much care was exercised in trying to produce a well-balanced and constructive program for each session. Therefore, in preparing one of our programs we decided that it was very essential that we should have an address on the subject of "Standardization as a Factor in National Defense." Some of us who are familiar with the methods used in the great central work at Washington, in trying to supply our armies in the field with all of the necessities of warfare, know that standardization at that time was a real factor in winning the war. We, therefore, believe that it is appropriate to include in our program an address on this subject. We requested the War Department to send representatives to attend our standardization conference, and that one of these representatives should give us an address on this subject. We requested that they send Col. George S. Gibbs of the general staff, and after a great deal of effort and correspondence, they advised us that the regulations did not permit it. We were, therefore, under the necessity of going up to the Secretary of War and getting permission for Colonel Gibbs and Major Ward to attend these conferences of the Standardization Division and for Colonel Gibbs to give us this address.

It is an old axiom that we value the most for which we have had to strive most. We, therefore, have great satisfaction in this opportunity to hear from the War Department on "Standardization as a Factor in National Defense." The man who will address us is a soldier—and soldiers, you know, are rated only according to their qualifications for fighting. Colonel Gibbs has a most enviable record as a fighter, as is indicated by his decorations. I do not want to embarrass him by my remarks, but these bars may not mean a great deal to you, not understanding them. If they were replaced by the decorations they represent, he would wear eleven national decorations, including one from the King of Belgium, one from the President of France, one from the King of England, one from the King of Italy, and all of the balance from the United States Government, including the Distinguished Service Medal. So he is a real soldier. (Applause.)

Col. Gibbs had a great deal of hesitation in coming before our organization and making an address, but we persuaded him to do so, and we are very grateful that he is here. Col. Gibbs. (Applause.)

STANDARDIZATION AND NATIONAL DEFENSE

By COL. GEORGE S. GIBBS

Mr. Chairman, Members of the Conference: The Secretary of War has directed me to express to you his deep interest in the great work of standardization and to assure you how thoroughly its importance is realized by the War Department.

The Assistant Secretary, Colonel Wainwright, upon whom Congress has imposed supervision of the business features of the War Department, is not only an enthusiastic supporter of standardization, but may be depended upon to apply its prin-

ciples in a practical way wherever it can be done. If it had been at all possible for him to have come out here at this time to address you, he would have given you those assurances in person.

During my attendance at the sessions of this Congress, both old friends and new acquaintances have said: "How does it come that *you* are attending a mining congress?" and "What is the interest of the *War Department* in standardization of articles connected with the mining industry?"

If I shall be able to tell you—and show you—how tremendously vital standardization, in its broadest application, is to the War Department, I will have fulfilled my mission here.

As we look across this broad land, and about the city in which we have gathered, the things that impress us most are the institutions that represent the growth and progress of our civilization. They are built of iron and stone and all manner of things that man has turned to his uses. They include family and social and civic standards and relations that represent generations of painstaking cultivation. Were all this wiped out, who knows whether or not it could ever be restored or how many centuries it would take in the rebuilding?

WHY NATIONAL DEFENSE?

In order that it may progress along its course of destiny—in order even to survive its alloted time—this great Nation of ours must protect what it has gained. It must guard what it has built, and secure the freedom and opportunity to grow and build and live. That is *National Defense*.

Those rights and opportunities may often be secured, up to a certain point, by diplomacy. But always when the issue reaches the stage of survival or extinction, the right to survive can only be assured by relying upon that second stage of diplomacy—the force of arms.

THE ESSENTIAL NEEDS OF DEFENSE

The essential needs of defense are men and supplies, or personnel and material. The men must be trained and have the will to win. The supplies must be suitable for their uses and adequate in quantity. That is where *standardization* comes in. It represents the difference, on the one hand, between being able to get the needed quantities of uniform articles of tested usability, and on the other hand, of being restricted and harassed by a hodgepodge of varieties the usable quantities of which are always insufficient.

IMPORTANCE OF STANDARDIZATION

The importance of standardization of war supplies cannot be exaggerated. In these days war involves the united effort of

an entire Nation and the combined employment of all of its principal industries. How is it possible to harmonize the use of thousands of articles to a common end except by the adoption of a far reaching and effective program of standardization?

Perhaps the most crying need for standardization is in machines—machines for making articles, and particularly machines for making other machines. Those of you who buy and use machinery are only too well aware of the truth of this statement, and this brings up the question of a foolish and wasteful conflict that is the greatest enemy of standardization.

THE FIGHT BETWEEN "INDIVIDUALITY" AND STANDARDIZATION

Just after the Spanish War, more than twenty years ago, a determined effort was made to bring about the adoption of standard containers for medicines. Types of bottles were devised that were ideal from every standpoint. Measures were blown in the glass at no additional expense, and the shapes were right for economical and safe packing. Their adoption was resisted by the big manufacturers, who insisted upon putting out their product in hundreds of varieties of bottles of peculiar and distinctive shapes. It is needless to point out the wastefulness of this practice, and I believe that it is equally misguided, as it should be possible to make labels and wrappings that would serve the purposes of individuality and attractiveness.

The Government once bought meteorological instruments from a maker who purposely used a foreign screw thread, so that simple brass screws needed for repairs had to be bought from him, and him alone.

A certain manufacturer of shoes in this country recently reported that he had in current use more than ten thousand different shoe lasts. Five hundred lasts, or one twentieth of that number, would provide shoes to fit every man, woman and child in America, and allow several styles for selection.

Manufacturers are today paying large salaries to clever men whose sole mission is to produce articles and variations of articles that are utterly different from those obtainable elsewhere, the use of which cannot be combined with the use of any other article.

As a money-making proposition, this is of doubtful utility. In the larger markets of the world buyers cannot afford to purchase articles that become useless unless a single, distant maker can be reached.

These examples will appeal to you from a business standpoint. From the standpoint of National Defense the use of non-standard articles produces incalculable waste of money, and what is worse, it wastes time that is precious and jeopardizes the success of an effort upon which our very existence may depend.

The fight against this thing is your fight, both as business men and patriots, and to make headway you will have to be very aggressive and very industrious.

It is not to be expected, nor do you want your Uncle Samuel to go so far in paternalism, as to take this matter out of your hands.

Right here I wish to add an observation that has come to me during my attendance at these conferences.

I have been impressed with the earnestness and enthusiasm of some of the Committees and their members. They are undertaking work that they can ill afford the time to do, and generously propose to continue it. But, it seems to me, this method of procedure alone will not produce results as fast as the need for progress in standardization demands. This volunteer work is all right—it is needed especially because it enlists the participation of the men who know the industry and its needs better than any others, and whose services cannot be hired.

Should this not be supplemented by a small professional standardization group that will devote 100 per cent of its time to that work, co-ordinating and speeding up the work of committees and sponsors, and getting actual results in a few weeks that would otherwise take two or three annual congresses to complete? What do you suppose the American Engineering Standards Committee would accomplish if it were not for Dr. Agnew, the Secretary, and his very limited office force?

On seeing the scope of the work undertaken by the Mining Congress, I asked why that body was doing it instead of the Institute of Mining Engineers, and was told that the Mining Congress had taken it up because the Institute of Mining Engineers had not accepted it as its responsibility and was not making headway.

What body does it is not so important, but it is necessary that all of the work shall head up into one controlling center, and that there shall not be division and pulling at cross purposes.

Either one body should do all the work, or complete cooperation effected.

HOW THE WAR DEPARTMENT DOES IT

Since writing this I have, of course, listened to Col. Roberts' statements or explanation of the correlating committee. They do, in a measure, cover what I have pointed out in these remarks, but they do not cover the one feature that I tried to bring out here, and that is of having a secretarial or professional standardization crew on the job to work night and day, if necessary, so as to get results so that we can have them while some of us still live rather than in the far distant future.

The War Department is not only supporting the efforts toward the adoption of national and international standards, but has gone much farther. The Secretary of War has directed that

American Standards, when adopted, shall be incorporated in all specifications of articles of supply to which they pertain. He has also directed that in the adoption of articles for military use, the standard articles of commerce will be selected when they are at all suitable for the purpose, and that special types be avoided whenever possible.

In this connection, I wish to say that before we went into this war you could have taken a thousand-dollar bill in one hand a galvanized Q. M. bucket in the other, and you could have gone through this country and you couldn't have gotten a galvanized bucket according to the government specifications—not one—with your thousand-dollar bill. Of course, the War Department was at fault in having an article so special as that. On the other hand, the industry was equally at fault because when we had to have buckets in larger quanties we went out and tried to get them, and there weren't buckets that were at all suitable in sufficient quantity to supply anywhere near the demand.

The organizational arrangement in the War Department for determining types of articles of equipment and supply and for preparing specifications therefor is rather cleverly worked out and I am sure that it will interest you.

First: The users, the troops themselves as represented by the Chiefs of the several arms, make known what they want. Conflicting views are co-ordinated by the General Staff.

Second: The Chief of the supply branch responsible for procuring that class of article has the research and engineering work done and samples prepared. The type receives final approval by the Secretary of War and the article is prescribed in equipment tables.

A SYSTEM OF AUTOMATIC CO-ORDINATION

The final preparation of the specification that becomes the basis of procurement is the responsibility of the Chief of the supply branch. Each such branch has a technical committee charged with preparing and carrying out a definite program of preparing specifications of all articles procured by that branch. This is a task that will take years to complete.

A representative of each using or interested service meets with this committee in order to see that the interests of his service are taken care of. When complete agreement is reached, the Chief of the supply branch may approve and publish the specification without further action or approval. If there is a disagreement, which rarely occurs, the matter is sent to the General Staff for adjustment.

As you doubtless know, there are seven Supply Branches of the Army. The Quartermaster Corps procures all equipment and supplies for its own activities, and all general supplies of a

commercial character. The Ordnance Department procures guns of all calibers, ammunition and other articles classed as ordnance. The Medical Department, Corps of Engineers, Signal Corps, Chemical Warfare Service, and Air Service procure the special articles that pertain directly to their several functional duties in the Army.

Congress has recently provided that the Assistant Secretary of War "shall be charged with the supervision of the procurement of all military supplies and other business of the War Department pertaining thereto and the assurance of adequate provision in the mobilization of material and industrial organizations essential to war-time needs."

Thus the *business* features of military supply are grouped under one supervising head.

The *military* features are worked out by the General Staff. They include *what* articles are needed, the *quantities* required, *when* they are needed, and *where* they are to be delivered.

It requires no imagination to see how tremendously both the business and military interests of the War Department can be assisted by standardization.

All the agencies described are keenly alive to it, and it may be safely predicted that business firms dealing with the War Department will find a steady and gratifying improvement in the clearness and simplicity of its requirements. The principle of standardization is likewise being extended to business methods—particularly to forms of contracts.

There are many obstacles that prevent the War Department from acting as sponsor in initiating standards in commercial articles. It is perhaps well that this is so, for the leading position in that field belongs to the great industrial and engineering bodies of the country.

The War Department acknowledges its position as a grateful beneficiary, and begs that you who are the real leaders in standardization will put forth an extra effort as a contribution to patriotism. In achieving commercial supremacy you can by the same means and at the same time, add security to the National defense.

CHAIRMAN ROBERTS: I think you will all agree with me NOW that when Col. Gibbs told me he was *only* a soldier he was deceiving me. (Applause.)

I cannot refrain at this time from improving the opportunity of replying to the most excellent suggestion that the Colonel has made regarding our voluntary Standardization organization. He has analyzed the situation correctly; it would take us a long time to complete any standardization program by our present method, but we are employing the only forces available—the voluntary services of the men in the industry interested in standardization. I agree with him entirely that if this program is to be completed in the near future so that we who are living shall reap the benefit of it, and not our children, we must have a regular paid organization to do this work.

One more fact: If we are going to keep our place, even our present place in the commercial world, we will have to speed up our standardization work very materially.

I would like to just take a few minutes to tell you what our neighbors

across the sea are doing on standardization. They have already completed a program that will take us a long time to equal. There are fifteen national bodies on standardization in Europe—*national* bodies, please note—that have this work under way. Great Britain and Germany are foremost with these organizations. Great Britain's organization is twenty years old. They have been actively engaged in standardization work for twenty years and they have completed a program that will take us years to reach with our best efforts. They have already produced 150 national standards, and they use specifications from these standards, applying them to their foreign trade, and they translate them into languages all over the world. Great Britain today expects to maintain her commercial supremacy largely through standardization of her products. Germany's organizations on standardization are only four years old. These organizations were built up during the war, trying to hold together her commercial institutions, but already she has produced one hundred and fifty national standards, and has five hundred tentative national standards—that is, they are on trial for a year or so, and then they are revised and made national standards.

They have a journal of standardization published semi-monthly that has eight thousand circulation. They also issue loose leaf specifications for any particular article which has been standardized and they sell to the manufacturers of Germany every month, 100,000 specifications of that character. There are 5,000 industrial firms in Germany that are supporting their national standardization movement. Germany hopes, through standardization, to regain her commercial supremacy, as well as rebuild her industries at home.

So much for our competition abroad. At home we have a national standards organization, referred to by Col. Gibbs and some of the other speakers, as the American Engineering Standards Committee. This committee has only barely begun to function, and its support by the industries of this country is still so meager that the staff is necessarily small, and what they hope to accomplish until they are supported more largely by the industries of this country will not enable them to in any way compete with these foreign organizations. It certainly is time that American industry awoke to the value of standardization.

This completes our program for this evening. We thank you very much for coming out and listening to our rather technical subjects.

SECRETARY CALLBREATH: May I say a word before we adjourn? As has been said by your chairman this evening, there must be help given to him in this work. I assume that the work which Col. Roberts has done for this purpose and this cause this year could not have been hired from him for half the total income of the American Mining Congress. We shall not be able to hire any one to do work to be compared with that which he has accomplished. I want to pay this tribute to him publicly—that no man has ever served the Mining Congress' aspiration so loyally, so faithfully, so earnestly, so continuously, as has Col. Roberts. (Applause.) We hoped a year ago to be able to hire for him an assistant, who, under his direction could perform much of the detail which he has been forced to attend to himself. Unfortunately, we were not financially able to do it. I hope the coming year we shall be able to provide for him whatever corps of assistants he desires and to any extent that he desires such assistants, and we shall only hope that Col. Roberts will continue to give us enough of his time to direct those assistants.

It is to me a very great personal pleasure and satisfaction to acknowledge his loyal service to this work, and to recognize the value of his recommendations among which not the least of is that which calls for further support for the American Engineering Standards Committee. I believe that we should do our part toward making that committee able

to do its part in the bigger, broader work which covers the standardization of all industries.

This is indeed an important work and we must not neglect it. I feel sure, or at least I feel hopeful, that within the very near future we shall be able to provide the means by which Col. Roberts may be supported and Col. Mitke, heading the other branch of the committee, may be supported, so that each shall have that assistance which is essential to help them carry on this work.

I thank you, and I hope that you will tender to Col. Roberts now the full endorsement of his efforts. (Applause.)

A motion was duly made, seconded and unanimously carried to extend Col. Roberts a rising vote of appreciation.

The meeting adjourned at nine forty-five p. m.

TABLE OF CONTENTS

	Page
Address of Welcome—H. C. Adams	3
Annual Address of President—W. J. Loring	4
Coal Operators, Special Session of	171
Directors, Election of	196
Eighth General Session of Convention	310
Executive Committee, Election of	258
Exposition of Mines and Mining Equipment	3
Fifth General Session of Convention—Devoted to the Subject of Standardization	196
Fourth General Session of Convention	122
Herbert Hoover, Message from Secretary of Commerce	835
Members' Annual Banquet	281
Members' Annual Meeting	339
Message from President Harding	355
Message from Senator Tasker L. Oddie	52
National Conference of Coal Operators	341
National Educational Conference	542
National Gold Conference	508
National Mine Tax Conference	364
National Oil Shale Conference	445
National Standardization Conference	577
Nominating Committee, Election of	339
Officers and Directors	857
Officers, Election of	258
Opening Session of Convention	3
Preliminary Conferences	3
Previous Session of Congress	2
Resolutions as Finally Adopted	215-310
Resolutions Committee, Appointment of	143
Second General Session of Convention	26
Seventh General Session	243
Sixth General Session of Convention	215
Special Session Devoted to Discussion of Methods for Increasing Use of Metal Products	101
Standing Committees	858
Third General Session of Convention	54
Underground Loading Conference	532

GENERAL INDEX

ADDRESSES AND PAPERS

	Page
Address of Temporary Chairman H. C. Adams	3
American Oil Resources—H. G. James	171
Arizona Tax Laws—Charles R. Howe	411
Arizona Tax System—T. O. McGrath	427
Bureau of Mines Investigation of Underground Loading Devices—K. Baumgarten	533
Coal and Labor—Edwin Ludlow	20
Co-operative Effort in the Coal Industry—J. D. A. Morrow	342
Copper, a Metal of Commerce—Thomas D'Arcy Brophy	107
Commercial Future of Copper, Brass and Bronze, The—Capt. Harry George	113
Coal Industry and the Public, The—Thomas H. Watkins	123
Co-operation of the Department of Commerce with the Mineral Industry—Message from Secretary Herbert A. Hoover—Presented by H. C. Morris	835
Can an Efficient Course in Mining Be Given in Four Years?—Prof. Robert Peele	545
Chemistry—Dr. Edward F. Smith	282
Competitive Costs and Marketing Methods in the Sale of American Coals Abroad—C. A. Owen	231
Co-operation in Dissemination of Oil Shale Data—S. E. Barnwell	485
Electric Arc Welding—E. Wanamaker	190
Essentials of an American Foreign Mineral Policy, The—C. K. Leith	320
Federal Department of Mines, A—Hon. Samuel D. Nicholson	154
Federal Tax Administration—Robert N. Miller	372
Federal Tax Legislation—Geo. E. Holmes	436
Foreign Trade and Its Effect Upon Domestic Industry—E. M. Herr	223
Future Electrification in the Development of Mining Industries—G. B. Rosenblatt and Graham Bright	329
Government and Industry—Hon J. A. O. Preus	27
Industrial Problems—Charles M. Schwab	293
Iron Ore Reserves in Minnesota—C. Zapffe	428
Labor Unions and the Mine Operators—H. N. Taylor	144
Legal Responsibility of Labor Unions, The—P. H. Penna	180
Mine Management—W. H. Williams	160
Mining Opportunities in the Far East—H. Foster Bain	243
Methods Used in Europe in the Control of Coal Mines and in the Distribution of Their Products—George S. Rice	260
Montana Tax Laws—D. M. Kelley	385
Mine Taxation in Minnesota—J. G. Armson	395
Michigan Tax Methods—L. P. Barrett	417
Mine Taxation in Utah—A. G. Mackenzie	424
Mine Taxation—A. P. Ramstedt	442

Page
New and Extended Uses of Zinc Products—Eugene H. Wolff..... 277
National Conference of Commission on Uniform State Laws—N. W. MacChesney 366
Oil Shales—J. A. Ede..... 503
Opportunities for American Organizations in Mexico—Luis N. Rubalcaba 217
Plea for Sound Economic Propaganda—A. E. McGregor..... 75
Possibilities for the Development of a Permanent Export Market for American Coal—Dr. Henry Mace Payne..... 239
Present Industrial Situation in the West Virginia Coal Fields—E. L. Greever 85
President's Annual Address—W. J. Loring..... 4
Problems of the Mining Industry—Francis S. Peabody..... 7
Problems of the Railroads, The—C. H. Markham..... 54
Protecting American Industry—Wm. J. Hale..... 274
Recent Legislative Developments Relating to the Coal Industry in Washington—George H. Bailey..... 349
Recent World Wide Progress in Oil Shale Development—Victor C. Alderson 477
Reply of Senator Tasker L. Oddie to Secretary of Treasury A. W. Mellon 513
Selling the Coal Industry to the Public—C. E. Lesher..... 356
Some Items in a Prosperity Program—George Otis Smith..... 62
Some Methods for Increasing the Use of Silver—Sidney J. Jennings 101
Some Notes on the Production of Oil from Shale—Lewis B. Skinner 487
Standardization as a Factor in Stabilization of the Coal Industry—C. E. Lesher..... 200
Standardization and National Defense—Col. George S. Gibbs..... 206
Tax Laws of New Mexico—E. C. Stimson..... 380
Taxation of Mines in Mexico—L. de Silva..... 391
The Needs of Alaska—Falcon Joslin..... 39
Valuation of Mines—J. C. Dick..... 406
What Can Be Taught in a Four-Year Course?—Prof. C. C. O'Harra. 564

STANDARDIZATION DIVISION

Joint Sessions, Metal and Coal Mining Branches

American Engineering Standards Committee and National Standards—A. A. Stevenson..... 693
Benefits of Standardization as Reflected by Insurance Rates—C. B. Butterfield 736
Government Interest in Standardization for Mining Industry—Prof. E. A. Holbrook..... 704
Industrial Standardization in Europe—Dr. P. G. Agnew..... 698
National Co-ordination of Standardization Through the General Correlating Committee—Col. Warren R. Roberts..... 751
Safety and Standards—S. J. Williams..... 720
Standardizing Research Results Through Public Information—C. R. Thomas 726
Standardization Movement in Canada, The—E. J. Durley..... 744

COAL MINING BRANCH

Page

Design and Construction of Mine Cars, Report of Sub-Committee on—Col. J. Milliken, Chairman 622
Mine Drainage, Report of Committee on—E. D. Knight, Chairman.. 587
Mine Locomotives, Report of Sub-Committee on—Graham Bright, Chairman 621
Mine Tracks and Signals, Report of Sub-Committee on—Fred Norman, Chairman 625
Mine Ventilation, Report of Committee on—Wm. J. Montgomery, Chairman 605
Outside Coal Hauling Equipment, Report of Committee on—H. M. Payne, Chairman 603
Underground Power Transmission and Power Equipment, Joint Report of Committees on—A. B. Kiser and K. A. Pauly, Chairmen 649
Underground Mining and Loading Machines, Report of Committee on—C. A. Cabell, Chairman 675
Underground Transportation, Report of Committee on—C. E. Watts, Chairman 620

METAL MINING BRANCH

Drilling Machines and Drill Steel, Report of Committee on—Norman B. Braly, Chairman 762
Drilling Machines and Drill Steel—George H. Gillman 774
Effect of Cartridge Diameter on Strength and Quickness of High Explosives—Charles S. Hurter 768
Fire Fighting Equipment, Report of Committee on—William Conibear, Chairman 759
Mechanical Loading Underground, Report of Committee on—Lucien Eaton, Chairman 759
Metal Mine Accounting, Report of Committee on—T. O. McGrath, Chairman 803
Metal Mine Ventilation, Report of Committee on—Chas. A. Mitke, Chairman 783
Mine Timbering, Report of Committee on—Gerald Sherman, Chairman 786
Mine Timber Preservation—R. R. Horner and George M. Hunt 800
Steam Shovel Equipment, Report of Committee on—H. C. Goodrich, Chairman 782
Underground Transportation, Report of Committee on—William B. Daly, Chairman 807

SPEAKERS

(Including Authors of Papers and Reports Read by Chairmen)

Adams, H. C.—Welcoming Delegates 3
Alderson, Victor C.—Recent World Wide Progress in Oil Shale Development 477

Page
Armson, J. G.—Mine Taxation in Minnesota 395
Bailey, George H.—Recent Legislative Development Relating to the Coal Industry in Washington 349
Bain, H. Foster—Mining Opportunities in the Far East 243
Barrett, L. P.—Michigan Tax Methods 417
Barnwell, S. E.—Co-operation in Dissemination of Oil Shale Data .. 485
Baumgarten, K.—Bureau of Mines Investigation of Underground Loading Devices 533
Bright, Graham, and Rosenblatt, G. B.—Future Electrification in the Development of the Mining Industries 329
Brophy, Thomas D'Arcy—Copper, a Metal of Commerce 107
de Silva, L.—Taxation of Mines in Mexico 391
Dick, J. C.—Valuation of Mines 406
Ede, J. A.—Oil Shales 503
Fulton, C. H.—Paper by Prof. Robert Peele 545
George, Capt. Harry—Commercial Future of Copper, Brass and Bronze 113
Gibbs, Col. George S.—Standardization and National Defense 206
Greever, E. L.—Present Industrial Situation in West Virginia Coal Fields 85
Hale, Wm. J.—Protecting American Industry 274
Herr, E. M.—Foreign Trade and Its Effect Upon Domestic Industry 223
Holmes, George E.—Federal Tax Legislation 436
Hoover, Herbert A., Secretary of Commerce—Co-operation of the Department of Commerce With the Mineral Industry 835
Howe, Charles R.—Arizona Tax Laws 411
James, H. G.—American Oil Resources 171
Jennings, Sidney J.—Some Methods for Increasing the Use of Silver 101
Joslin, Falcon—The Needs of Alaska 39
Kelley, D. M.—Montana Tax Laws 385
Leith, C. K.—Essentials of an American Foreign Mineral Policy 320
Lesher, C. E.—Selling the Coal Industry to the Public 356
Lesher, C. E.—Standardization as a Factor in Stabilization of the Coal Industry 200
Loring, W. J.—President's Annual Address 4
Ludlow, Edwin—Coal and Labor 20
MacChesney, N. W.—National Conference of Commission on Uniform State Laws 366
Mackenzie, A. G.—Mine Taxation in Utah 424
Markham, C. H.—Problems of the Railroads 54
McGrath, T. O—Arizona Tax System 427
McGregor, A. E.—A Plea for Sound Economic Propaganda 75
Miller, Robert N.—Federal Tax Administration 372
Morris, H. C.—Message from Secretary of Commerce Herbert A. Hoover 835
Morrow, J. D. A.—Co-operative Effort in the Coal Industry 342
Nicholson, Hon. Samuel D.—A Federal Department of Mines 154

Page
Oddie, Hon. Tasker L.—Reply to Secretary of Treasury A. W. Mellon 513
O'Harra, C. C.—What Can Be Taught in a Four-Year Mining Engineering Course? 564
Owen, C. A.—Competitive Costs and Marketing Methods in the Sale of American Coals Abroad 231
Payne, Dr. Henry Mace—Possibilities for the Development of a Permanent Export Market for American Coal 239
Peabody, Francis S.—Problems of the Mining Industry 7
Penna, P. H.—Legal Responsibility of Labor Unions 180
Preus, Hon. J. A. O—Government and Industry 27
Ramstedt, A. P.—Mine Taxation 442
Rice, George S.—Methods Used in Europe in the Control of Coal Mines and in the Distribution of Their Products 260
Rosenblatt, G. B., and Bright, Graham—Future Electrification in the Development of the Mining Industries 329
Rubalcaba, Luis N.—Opportunities for American Organizations in Mexico 217
Schwab, Charles M.—Industrial Problems 293
Smith, George Otis—Some Items in a Prosperity Program 62
Smith, Dr. Edward F.—Chemistry 282
Stimson, E. C.—Tax Laws of New Mexico 380
Skinner, Lewis B.—Some Notes on the Production of Oil from Shale 487
Taylor, N. H.—Labor Unions and the Mine Operator 144
Wanamaker, E.—Electric Arc Welding 190
Watkins, Thomas H.—The Coal Industry and the Public 123
William, W. H.—Mine Management 160
Wolff, Eugene H.—New and Extended Uses of Zinc Products 277
Zapffe, C.—Iron Ore Reserves in Minnesota 428

STANDARDIZATION DIVISION

Joint Sessions, Metal and Coal Mining Branches

Agnew, Dr. P. G.—Industrial Standardization in Europe 698
Butterfield, C. B.—Benefits of Standardization as Reflected by Insurance Rates 736
Durley, E. J.—Standardization Movement in Canada 744
Holbrook, Prof. E. A.—Government Interest in Standardization for Mining Industry 704
Roberts, Col. Warren R.—National Co-ordination of Standardization Through the General Correlating Committee 751
Stevenson, A. A.—American Engineering Standards Committee and National Standards 693
Thomas, C. R.—Standardizing Research Results Through Public Information 726
Williams, S. J.—Safety and Standards 720

COAL MINING BRANCH

Bright, Graham—Report of Sub-Committee on Mine Locomotives 621
Cabell, C. A.—Report of Committee on Underground Mining and Loading Machines 675

Page
Kiser, A. B., and Pauly, K. A.—Report of Committees on Underground Power Transmission and Power Equipment..... 649
Knight, E. D.—Report of Committee on Mine Drainage..... 587
Milliken, Col. J.—Report of Sub-Committee on Design and Construction of Mine Cars..... 622
Montgomery, Wm. J.—Report of Committee on Mine Ventilation.. 605
Norman, Fred—Report of Sub-Committee on Mine Tracks and Signals 625
Pauly, K. A., and Kiser, A. B.—Report of Committees on Underground Power Transmission and Power Equipment..... 649
Payne, H. M.—Report of Committee on Outside Coal Handling Equipment 603
Watts, C. E.—Report of Committee on Underground Transportation 620

METAL MINING BRANCH

Braly, Norman B.—Report of Committee on Drilling Machines and Drill Steel 762
Conibear, William—Report of Committee on Fire-Fighting Equipment 759
Daly, William B.—Report of Committee on Underground Transportation 807
Eaton, Lucien—Report of Committee on Mechanical Loading Underground 759
Gillman, George H.—Standardization of Drilling Machines and Drill Steel 774
Goodrich, H. C.—Report of Committee on Steam Shovel Equipment. 782
Horner, R. R., and Hunt, George M.—Mine Timber Preservation.... 800
Hunt, George M., and Horner, R. R.—Mine Timber Preservation..... 800
Hurter, Charles S.—Effect of Cartridge Diameter on Strength and Quickness of High Explosives..... 768
McGrath, T. O.—Report of Committee on Metal Mine Accounting... 803
Mitke, Charles A.—Report of Committee on Metal Mine Ventilation.. 782
Sherman, Gerald—Report of Committee on Mine Timbering..... 786

OFFICERS AND COMMITTEES

The American Mining Congress

1921

OFFICERS

W. J. LORING, President
DANIEL B WENTZ, First Vice-President
E. L. DOHENY, Second Vice-President
THOMAS T. BREWSTER, Third Vice-President
J. F. CALLBREATH, Secretary

DIVISION STAFF

E. C. PORTER, Convention Manager
GEORGE H. BAILEY, Counsel
HAROLD N. LAWRIE, Economist
H. W. SMITH, Chief, Mineral Tariffs Division
M. W. KRIEGH, Tax Division
E. H. PULLMAN, Publicity Department
IRA L. SMITH, Asst. Publicity Department
E. R. COOMBES, Asst. to Secretary

DIRECTORS

W. J. LORING, San Francisco, Calif.
BULKELEY WELLS, Denver, Colo.
DANIEL B. WENTZ, Philadelphia, Pa.
JOHN C. HOWARD, Salt Lake City, Utah
THOMAS T. BREWSTER, St. Louis, Mo.
CARL SCHOLZ, Charleston, W. Va.
H. W. SEAMAN, Chicago, Ill.
E. L. DOHENY, Los Angeles, Calif.
SIDNEY J. JENNINGS, New York City
HUGH SHIRKIE, Terre Haute, Ind.
ROBERT LINTON, New York City
JAMES S. DOUGLAS, Douglas, Ariz.

EXECUTIVE COMMITTEE

W. J. LORING
ROBERT LINTON
SIDNEY J. JENNINGS

STATE VICE-PRESIDENTS

Alabama—J. B. McClary, 1109 Brown Marx Bldg., Birmingham
Alaska—John A. Davis, Fairbanks
Arizona — Norman Carmichael, Arizona Copper Co., Clifton
Arkansas—Ross Blake, Batesville
California—George W. Starr, Grass Valley
Colorado—George E. Collins, 414 Boston Bldg., Denver
Georgia—George L. Pratt, Third National Bank Bldg., Atlanta
Idaho—Jerome J. Day, Wallace
Indiana—J. C. Kolsem, Terre Haute
Illinois—H. C. Adams, Peerless Coal Co., McCormick Bldg., Chicago
New Mexico—John M. Sully, Hurley
New York—Sidney J. Jennings, 120 Broadway, New York
Kansas—O. M. Bilharz, Baxter Springs
Kentucky—Alexander Blair, Jr., Baskett
Maine—C. Vey Holman, Holman Oaks, Rockland
Massachusetts—Frank P. Knight, 50 Congress St., Boston
Michigan—Gordon R. Campbell, care of Calumet & Ariz. Mining Co., Calumet
Minnesota—Charles W. Potts, Deerwood
Missouri—Edgar Wallower, Keystone Hotel, Joplin
Nevada—C. B. Lakenan, McGill
North Dakota—Hansen Evesmith, 310 8th St., S. Fargo
Ohio—W. R. Woodford, 744 Kirby Building, Cleveland
Oregon—Robert M. Betts, Cornucopia
Oklahoma—J. F. Robinson, Commerce Mining & Royalty Co., Miami
Pennsylvania—S. D. Warriner, Philadelphia
Tennessee—J. M. Overton, Nashville
Utah—Imer Pett, 404 Dooly Block, Salt Lake City
Virginia—Lee Long, Dante
Washington—Conrad Wolfle, Yale Hotel, Chewelah
Wisconsin—O. C. Irwin, Berlin
West Virginia—George T. Watson, Fairmont
Wyoming—B. B. Brooks, Casper

COMMITTEES, 1921

CO-OPERATION

AMERICAN MINING CONGRESS AND AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

A. M. C.

Henry Mace Payne, Machinery Club, New York City
A. Cressy Morrison, 42nd St. Bldg., New York City
J. E. Spurr, Hill Bldg., New York City
W. R. Ingalls, 115 Broadway, New York City
J. R. Finlay, Room 802, 45 Cedar St., New York City
Daniel B. Wentz, Land Title Bldg., Philadelphia, Pa.

A. I. M. & M. E.

E. P. Mathewson, 42 Broadway, New York City
W. L. Saunders, 11 Broadway, New York City
Walter Douglas, 99 John St., New York City
Benjamin B. Thayer, 42 Broadway, New York City
Edwin Ludlow, 149 Broadway, New York City
Samuel Taylor, Second National Bank Bldg., Pittsburgh, Pa.

TARIFF

A. H. Jarman, San Francisco, California
Charles W. Potts, Deerwood, Minnesota
B. F. Phillipson, New York City
A. B. Conklin, Clay Graphite Co., Ashland, Ala.
A. G. Woodruff, Garrisonville, Va.
Edgar Wallower, Joplin, Missouri
Nelson Franklin, 603 Symes Bldg., Denver, Colo.
Jerome J. Day, Wallace, Idaho
H. P. Baker, New Idria Quicksilver Mining Co., 157 Federal St., Boston, Mass.

ALASKAN AFFAIRS

John A. Davis, Fairbanks, Alaska
Falcon Joslin, 2203 L. C. Smith Bldg., Seattle, Wash.
Bart L. Thane, 408 Crocker Bldg., San Francisco, Calif.

MINING IN FOREIGN COUNTRIES

J. E. Spurr, *Chairman*

Hill Bldg., New York City

Van H. Manning, 15 West 44th St., New York City
E. L. Doheny, Security Bldg., Los Angeles, Calif.
W. J. Loring, Crocker Bldg., San Francisco, Calif.
Matthew C. Fleming, New York City
H. Foster Bain, Bureau of Mines, Washington, D. C.

BLUE SKY LEGISLATION

Will L. Clark, *Chairman,* Riverside, Calif.
Sidney Norman, Spokane, Washington
T. A. Rickard, San Francisco, Calif.
George E. Collins, Boston Bldg., Denver, Colo.
Martin H. Brede, Minneapolis, Minn.

ADVISORY COMMITTEE UNITED STATES BUREAU OF MINES AND GEOLOGICAL SURVEY

Bulkeley Wells, *Chairman,* Denver, Colo.
Walter Douglas, New York City
Rembrandt Peale, New York City
H. Foster Bain, U. S. Bureau of Mines, Washington, D. C.
George Otis Smith, U. S. Geological Survey Washington, D. C.

DEPARTMENT OF MINES AND MINING

W. J. Loring, *Chairman*

San Francisco, Calif.

Walter Douglas, New York City
Bulkeley Wells, Denver, Colo.
George H. Crosby, Duluth, Minnesota
D. C. Jackling, Hobart Bldg., San Francisco, Calif.
Carl Scholz, Charleston, W. Va.
S. D. Warriner, Philadelphia, Pa.

COOPERATION (INTERNAL REVENUE DEPARTMENT)

J. F. Callbreath, American Mining Congress, Munsey Bldg., Washington, D. C.
John T. Barnett, 1024 Lafayette St., Denver, Colo.
Paul Armitage, 2174, 233 Broadway, New York City.
L. C. Boyle, Kansas City, Mo.
Rush C. Butler, Chicago, Ill.

COAL EXPORTS

Dr. Henry Mace Payne, Machinery Club, New York City, *Chairman.*
Geo. S. Rice, Bureau of Mines, Washington, D. C.
John C. Callahan, Woodward Bldg., Washington, D. C.
Chas. A. Owen, Pres., Imperial Coal Corporation, 17 Battery Pl., New York City.

G. A. O'Reilly, Irving National Bank, New York City.

FEDERAL TAXATION

Paul Armitage, 233 Broadway, New York City.
A. Scott Thompson, Miami, Oklahoma.
John C. Howard, Utah Oil Refining Co., Salt Lake City, Utah.
George E. Holmes, 15 William St., New York City.
E. L. Doheny, Security Bldg., Los Angeles, Calif.
R. C. Allen, Kirby Bldg., Cleveland, Ohio
A. P. Ramstedt, Wallace, Idaho.

UNIFORM COAL MINE REPORTS

S. A. Taylor, Second National Bank Bldg., Pittsburgh, Pa.
Carl Scholz, Charleston, W. Va.
A. H. Land, Huntington, W. Va.
Morton L. Gould, 701 Terminal Bldg., Indianapolis, Ind.
G. H. Caperton, Box 601, Charleston, W. Va.
Thomas T. Brewster, St. Louis, Mo.

STANDARDIZATION DIVISION METAL AND COAL BRANCHES COAL MINING BRANCH

General Committee

Colonel Warren R. Roberts, *Chairman*, Chicago, Ill.
E. D. Knight, Cabin Creek Cons. Coal Co., Kayford, W. Va.
C. E. Watts, Efficiency Engineer, Berwind-White Coal Mining Company, Windber, Pa.
A. B. Kiser, Electrical Engineer, Pittsburgh Coal Co., Pittsburgh, Pa.
W. J. Montgomery, Manager, Ventilating Dept., Jeffrey Manufacturing Co., Columbus, Ohio.
K. A. Pauly, Power & Mining Engineering Dept., General Electric Co., Schenectady, N. Y.
C. A. Cabell, V. P., Carbon Fuel Company, Kanawha National Bank Bldg., Charleston, W. Va.
Dr. Henry Mace Payne, 300 Madison Ave., New York City.

UNDERGROUND TRANSPORTATION

C. E. Watts, *Chairman*

Charles M. Means, Consulting Engineering, Pittsburgh, Pa.
Graham Bright, Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa.
Joseph Bryan, General Electric Co., Pittsburgh, Pa.
F. C. Coseo, Jeffrey Manufacturing Co., Columbus, Ohio.
D. F. Lepley, General Manager, Connellsville Manufacturing & Supply Co., Connellsville, Pa.
E. A. Watters, General Supt., Hicks' Coal Companies, Leechburg, Pa.
J. Milliken, President, Industrial Car Mfgrs. Inst., 68 William St., New York City.
A. H. Ehle, General Sales Manager, Baldwin Locomotive Works, Philadelphia, Pa.
H. K. Porter, Mine Car Department, Hyatt Roller Bearing Co., New York City.
Frank S. Barks, President, Lincoln Steel & Forge Co., St. Louis, Mo.
Fred Norman, Chief Engineer, Allegheny River Mining Co., Kittanning, Pa.
T. A. Parker, Manager, Mine Car & Equipment Dept., St. Louis Structural Steel Co., St. Louis, Mo.

MINING AND LOADING EQUIPMENT

C. A. Cabell, *Chairman*

D. J. Carroll, Chicago, Wilmington & Franklin Coal Co., Benton, Ill.
E. N. Zern, Mining Engineer and Editor "Mining Catalog," Pittsburgh, Pa.
Carl Scholz, General Manager, Raleigh-Wyoming Coal Co., Charleston, W. Va.
N. D. Levin, Jeffrey Manufacturing Co., Columbus, Ohio.
J. M. Clark, Clark & Krebs, Charleston, W. Va.
M. Mitchell, Sullivan Machinery Co., St. Louis, Mo.
William Whaley, Myers-Whaley Co., Knoxville, Tenn.
Wm. O. Duntley, Duntley-Dayton Co., Chicago, Ill.
E. S. McKinley, 625 Denham Bldg., Denver, Col.
Wm. E. Hamilton, 310 Schultz Bldg., Columbus, Ohio.
Walter Stevens, Valier Coal Co., Valier, Ill.
S. W. Farnham, Mining Engineer, Goodman Mfg. Co., Chicago, Ill.
E. K. Bowers, Morgan-Gardner Electric Co., 68 E. Adams St., Chicago, Ill.
John G. Smyth, Consolidation Coal Co., Jenkins, Ky.

DRAINAGE

E. D. Knight, *Chairman*

M. C. Benedict, Consulting Engineer, Johnstown, Pa.
Walter D. Stockley, Fairmont, W. Va.
E. F. Austin, Manager Mine Pump Dept., Dravo-Doyle Co., Pittsburgh, Pa.

Cecil W. Smith, Mining Engr., Nokomis Coal Co., Old Colony Building, Chicago, Ill.

F. W. Smith, Mine Drainage Engr., Weinman Pump & Supply Co., Pittsburgh, Pa.

F. J. Emeny, Chief Engr., The Deming Company, Salem, Ohio.

Professor John W. Hallock, Head of Dept. of Industrial Engineering, University of Pittsburgh, Pittsburgh, Pa.

R. Y. Wert, Mine Drainage Supt., Durham Coal & Iron Co., Soddy, Tenn.

J. H. Edwards, Electrical Engr., Elkhorn Piney Coal Mining Co., Huntington, W. Va.

L. D. Tracy, Mining Engineer U. S. Bureau of Mines, Pittsburgh, Pa.

Walter D. Stockley, 1225 Fulton Building, Pittsburgh, Pa.

M. Spillman, Worthington Pump & Machinery Corp., Harrison, N. J.

Roscoe N. Woltz, Electrical Engr., Stonega Coal & Coke Co., Big Stone Gap, Va.

Henry E. Cole, Harris Pump & Supply Co., 320 Second Ave., Pittsburgh, Pa.

Chas. H. Matthews, M. A. Hanna & Co., Cleveland, O.

VENTILATION

W. J. Montgomery, *Chairman*

J. M. Doughty, Lehigh & Wilkes Barre Coal Co., Wilkes Barre, Pa.

Howard N. Eavenson, Mining Engr., Union Arcade Bldg., Pittsburgh, Pa.

J. C. Gaskill, Consolidation Coal Co., Fairmont, W. Va.

Martin J. Lide, Birmingham, Ala.

G. E. Lyman, Gen'l Supt., Madison Coal Corporation, Glen Carbon, Ill.

C. E. Sharpless, Engineer, Ebensburg Coal Co., Ebensburg, Pa.

E. B. Wagner, Lehigh Valley Coal Co., Wilkes Barre, Pa.

H. Bert Wright, Pocahontas Fuel Co., Pocohontas, Va.

E. N. Zern, Mining Engineer and Editor "Mining Catalog," Pittsburgh, Pa.

OUTSIDE COAL HANDLING EQUIPMENT

Henry Mace Payne, *Chairman*

G. F. Osler, G. S. Carnegie Coal Co., Pittsburgh, Pa.

W. A. Bishop, G. S. Pocahontas Cons. Collieries, Pocahontas, Va.

F. W. Whiteside, Chief Engineer, Victor American Fuel Co., Denver, Colo.

Jas. Needham, General Manager, St. Paul Coal Co., Chicago, Ill.

F. G. Morris, G. S. Coal Mines, Republic Iron & Steel Co., Sayreton, Ala.

M. A. Kendall, Chief Engineer, Stephens-Adamson Mfg. Co., Aurora, Ill.

Warren R. Roberts, Wrigley Building, Chicago, Ill.

Rudolph H. Kudlich, Asst. to Chief Mechanical Engr., U. S. Bureau of Mines, Washington, D. C.

UNDERGROUND POWER TRANSMISSION

A. B. Kiser, *Chairman*

Harry M. Warren, Electrical Engineer, D. L. & W. R. R., Scranton, Pa.

W. A. Chandler, care of Hudson Coal Co., Scranton, Pa.

R. L. Kingsland, General Superintendent, P. & M. Dept., Cons. Coal Co., Fairmont, W. Va.

Carl Lee, Electrical Engineer, Peabody Coal Co., McCormick Bl., Chicago, Ill.

L. C. Ilsley, 4800 Forbes St., Pittsburgh, Pa. (Bureau of Mines.)

POWER EQUIPMENT

K. A. Pauly, *Chairman*

D. C. McKeeham, Box 913, Union Pacific Coal Co., Rock Springs, Wyo.

G. S. Thompson, Colorado Fuel & Iron Co., Pueblo, Colo.

H. F. Randolph, Cons. Engr., 2330 Oliver Bldg., Pittsburgh, Pa.

M. D. Kirk, Pittsburgh Terminal R. R. Coal Co., Wabash Bl., Pittsburgh, Pa.

R. W. E. Moore, Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa.

R. L. Kingsland, Consolidated Coal Co., Fairmont, W. Va.

W. C. Shunk, Stonega Coal & Coke Co., Big Stone Gap, Va.

J. T. Jennings, Philadelphia & Reading Coal & Iron Co., Pottsville, Pa.

W. C. Adams, with Allen & Garcia, Chicago, Ill.

O. P. Hood, Chief Mechanical Engineer, Bureau of Mines, Washington, D. C.

Graham Bright, Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

A. J. Nicht, Allis Chalmers Co., Milwaukee, Wis.

Stephen H. Green, Pacific Coast Coal Co., Seattle, Wash.

Charles Legrand, Phelps Dodge Corp., Douglas, Ariz.

Martin J. Lide, Cons. Engr., Birmingham, Ala.

C. D. Woodward, Chief Electrical Engineer, Anaconda Copper Mining Co., Butte, Mont.

MINE TIMBERS
(In process of organization)

WELFARE
(In process of organization)

ADVISORY COMMITTEE ON SAFETY CODES

S. W. Farnham, Goodman Manufacturing Co., Chicago, Ill.—Representing Mining & Loading Equipment.

T. A. Parker, St. Louis Structural Steel Company, St. Louis, Mo.—Representing Underground Transportation.

Martin J. Lide, Consulting Engineer, Birmingham, Ala.—Representing Power Equipment.

A. B. Kiser, Pittsburgh Coal Co., Pittsburgh, Pa.—Representing Underground Power Transmission.

G. F. Osler, Carnegie Coal Co., Pittsburgh, Pa.—Representing Outside Coal Handling Equipment.

L. D. Tracy, U. S. Bureau of Mines, Pittsburgh, Pa. — Representing Mine Drainage.

JOINT COMMITTEE ON COORDINATION

Charles A. Mitke, *Chairman*

Representing Coal Mining Branch:

C. E. Watts, Windber, Pa.
E. D. Knight, Kayford, W. Va.
K. A. Pauly, Schenectady, N. Y.

Representing Metal Mining Branch:

Arthur Notman, Bisbee, Ariz.
William B. Daly, Butte, Mont.
Charles A. Mitke, Bisbee, Arizona.

JOINT PUBLICITY COMMITTEE

Representing Coal Mining Branch:

Ralph C. Becker, Chicago, Ill.
C. H. Trik, Jeffrey Mfg. Co., Columbus, Ohio.

Representing Metal Mining Branch:

Chas. F. Willis, Phoenix, Ariz.
T. O. McGrath, Bisbee, Ariz.

METAL BRANCH

General Committee

Charles A. Mitke, Bisbee, Ariz., *Chairman*

N. B. Braly, General Manager, North Butte Mining Co., 14 W. Granite St., Butte, Mont.

William B. Daly, Asst. General Manager, Anaconda Copper Company, Butte, Mont.

William Conibear, Inspector, Dept. of Safety, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

H. C. Goodrich, 1408 Deseret Bank Bldg., Salt Lake City, Utah.

Gerald Sherman, Phelps Dodge Corp., Douglas, Ariz.

Lucien Eaton, Superintendent, Ishpeming District, Cleveland-Cliffs Iron Company, Ishpeming, Mich.

T. O. McGrath, Shattuck Arizona Mining Co., Bisbee, Arizona.

Chas. F. Willis, Phoenix, Ariz.

DRILLING MACHINES AND DRILL STEEL

N. B. Braly, Chairman

Arthur B. Foote, North Star Mines, Grass Valley, Calif.

Arthur Notman, Superintendent, Mine Dept., Copper Queen Br., Phelps Dodge Corpn., Bisbee, Ariz.

O. J. Egleston, Manager, U. S. Smelting, Refining & Mining Co., Kennett, Calif.

C. S. Elayer, General Foreman, Arizona Commercial Mining Co., Globe, Ariz.

J. A. Fulton, Idaho-Maryland Mines Co., Grass Valley, Calif.

L. C. Bayles, Chief Engineer, Ingersoll-Rand Co., Phillipsburg, N. J.

H. Seamon, Efficiency Engineer, United Verde Copper Co., Jerome, Ariz.

Ocha Potter, Superintendent, Superior Division, Calumet and Hecla Mining Co., Houghton, Mich.

T. C. Baker, Asst. Gen'l Mgr., The Mexican Corpn., Edificio LaMutua, Mexico City, Mexico.

R. T. Murrill, Inspiration Cons. Copper Co., Inspiration, Ariz.

George H. Gilman, 125 Prescott St., East Boston, Mass.

Charles Lees, Superintendent, Iron Cap Copper Co., Copper Hill, Ariz.

Charles A. Smith, Mine Superintendent, Ray Cons. Copper Co., Ray, Ariz.

Roy Marks, Stope Engineer, Box 1676, United Verde Exten. Mining Co., Jerome, Ariz.

Earl Hastings, Foreman, Clay Mine, Arizona Copper Co., Ltd., Morenci, Arizona.

Frank Ayer, Mine Superintendent, Moctezuma Copper Co., Pilares De Nacozari, Sonora, Mexico.

W. G. Scott, Superintendent, Coronado Mines, Arizona Copper Co., Ltd., Metcalf, Ariz.

Charles Officer, Sullivan Machinery Co., Chicago, Ill.

A. S. Uhler, Ingersoll-Rand Co., New York City.

George A. Shaw, Efficiency Engineer, Denver Rock Drill Mfg. Co., Denver, Colo.

H. T. Walsh, V. P., Sullivan Machinery Co., Chicago, Ill.

R. A. Scott, S. M. Denver Rock Drill Mfg. Co., Denver, Colo.
Bruce Yates, Homestake Mining Co., Lead, S. D.

Inner Committee Drilling Machines and Drill Steel

Frank Ayer, Superintendent, Moctezuma Copper Co., Nacozari, Sonora, Mexico.
H. Seamon, Drill Efficiency Engineer, United Verde Copper Co., Jerome, Ariz.
Charles A. Smith, Superintendent, Ray Cons. Copper Co., Ray, Ariz.
Arthur Notman, Superintendent, Copper Queen Br., Phelps Dodge Corp., Bisbee, Ariz.
George Gilman, 125 Prescott St., E. Boston, Mass.
H. T. Walsh, Vice-President, Sullivan Machinery Co., Chicago, Ill.
George A. Shaw, Efficiency Engineer, Denver Rock Drill Manufacturing Co., Denver, Colo.
L. C. Bayles, Chief Engineer, Ingersoll-Rand Co., Phillipsburg, N. J.

MINE DRAINAGE

(In process of organization)

WELFARE WORK

Chas. F. Willis, *Chairman*

E. F. Irwin, Homestake Mng. Co., Lead, S. D.
Stanley L. Arnot, Plymouth Cons. Gold Mines, Plymouth, Calif.
H. C. Henrie, Phelps Dodge Corpn., Bisbee, Ariz.
Geo. A. Stahl, 603 Symes Bldg., Denver, Colo.
John L. Boardman, Butte, Mont.

UNDERGROUND TRANSPORTATION

William B. Daly, *Chairman*

George H. Booth, Mechanical Engineer, Inspiration Cons. Copper Co., Inspiration, Ariz.
Stanley A. Easton, Kellogg, Idaho.
John Kiddie, Arizona Copper Co., Morenci, Ariz.
Ole Hallingby, Lascelle Mine, Calumet & Hecla Mng. Co., Calumet, Mich.
Andover Syverson, Chief Engineer, United Verde Exten. Mining Co., Jerome, Ariz.
E. M. Morris, Asst. Supt. of Mines, Anaconda Copper Mining Co., Butte, Mont.
R. R. Boyd, Asst. Superintendent, Mine Dept., Copper Queen Branch, Phelps Dodge Corp., Bisbee, Ariz.
T. K. Scott, Chief Engineer, Box 100, Miami Copper Co., Miami, Ariz.
H. T. Hamilton, Manager, Moctezuma Copper Co., Nacozari, Son., Mexico.
R. E. Howe, Assistant General Manager, Cananea Cons. Copper Co., Cananea, Sonora, Mexico.
D. S. Calland, Managing Director, Compania de Real del Monte de Pachuca, Pachuca, Hidalgo, Mexico.
Robt. H. Dickson, Supt., Calumet & Arizona Mining Co., Warren, Arizona.

FIRE FIGHTING EQUIPMENT

William Conibear, *Chairman*

J. T. Young, Safety Inspector, Arizona Copper Company, Morenci, Ariz.
Orr Woodburn, Safety First Director, Globe-Miami District, Globe, Ariz.
A. A. Krogdahl, Safety Engineer, Oliver Iron Mining Co., Virginia, Minn.
Guy J. Johnson, Safety Engineer, Homestake Mining Company, Lead, S. Dak.
H. J. Rahilly, Superintendent, Mine Fire & Hydraulic Filling Dept., Anaconda Copper Mining Company, Butte, Mont.

STEAM SHOVEL EQUIPMENT

H. C. Goodrich, *Chairman*

Robert E. Tally, General Superintendent, United Verde Copper Company, Clarkdale, Ariz.
G. W. Barnhart, Manager, San Francisco Branch, Marion Steam Shovel Co., San Francisco, Calif.
T. A. Snyder, Bucyrus Co., Milwaukee, Wis.
Geo. Mieyr, Phelps Dodge Corpn., Bisbee, Ariz.
M. Curley, Gen'l Supt., New Cornelia Copper Co., Ajo, Arizona.
C. B. Lakenan, General Manager, Nevada Cons. Copper Co., McGill, Nev.
H. G. S. Anderson, Mining & Metallurgical Engineer, Hurley, N. Mex.

MINE VENTILATION

Charles A. Mitke, *Chairman*

A. C. Stoddard, Chief Engineer, Inspiration Cons. Copper Co., Box 15, Inspiration, Ariz.
D. Harrington, care Bureau of Mines, Denver, Colo.
Norman G. Hardy, Chief Mechanical Engineer, Smelter Dept., Arizona Copper Co., Clifton, Ariz.
W. A. Rowe, Chief Engineer, American Blower Co., Detroit, Mich.
E. B. Williams, Manager, Mine Fan Dept., B. F. Sturtevant Company, Hyde Park, Boston, Mass.
Robert N. Bell, State Mine Inspector, Boise, Idaho.

F. L. Stone, care General Electric Co., Schenectady, N. Y.

C. E. Legrand, Consulting Engineer, Phelps Dodge Corp., Douglas, Ariz.

O. K. Dyer, Buffalo Forge Company, Buffalo, N. Y.

Don M. Rait, Asst. Superintendent of Mines, Calumet and Arizona Mining Co., Warren, Ariz.

A. S. Richardson, Chief of Ventilating Department, Anaconda Copper Mining Co., Drawer 1375, Butte, Mont.

Walter G. Browning, Magma Copper Co., Superior, Ariz.

MECHANICAL LOADING UNDERGROUND

Lucien Eaton, *Chairman*

H. E. Billington, Manager of Sales, The Thew Shovel Co., Lorain, Ohio.

J. H. Hensley, Mine Superintendent, Miami Copper Company, Miami, Ariz.

Albin F. Victor, Manager of Sales, Lake Superior Loader Co., Duluth, Minn.

H. DeWitt Smith, Superintendent of Mines, United Verde Copper Co., Jerome, Ariz.

William Whaley, General Manager, Myers Whaley Co., Knoxville, Tenn.

R. W. Macfarlane, Mining Dept., Longfellow Div., Arizona Copper Co., Morenci, Ariz.

E. E. Whiteley, Calumet & Arizona Mng. Co., Warren, Ariz.

MINE TIMBERS

Gerald Sherman, *Chairman*

W. G. McBride, General Manager, Old Dominion Co., Globe, Ariz.

Ira B. Joralemon, Asst. General Manager, Calumet & Arizona Mining Co., Warren, Ariz.

Felix McDonald, Mines Superintendent, Inspiration Cons. Copper Co., Inspiration, Ariz.

John Kiddie, Division Superintendent, Arizona Copper Company, Morenci, Ariz.

W. S. Boyd, Manager Ray Cons. Copper Co., Ray, Ariz.

T. Evans, General Supt., Cananea Cons. Copper Co., Cananea, Sonora, Mexico.

G. W. Nicholson, General Supt., United Verde Exten. Mining Co., Jerome, Ariz.

C. L. Berrien, Anaconda Copper Co., Butte, Mont.

George M. Hunt, Forest Products Laboratory, Madison, Wisconsin.

MINE ACCOUNTING

T. O. McGrath, *Chairman*

L. S. Cates, General Mgr., Utah Copper Co., Salt Lake City, Utah.

J. C. Dick, Salt Lake City, Utah.

H. H. Miller, General Auditor, Hercules Mining Co., Wallace, Idaho.

H. L. Norton, Phelps Corporation, Douglas, Ariz.

Harry Vivian, Chief Engineer Calumet and Hecla Mining Co., Calumet, Mich.

L. K. Diffenderfer, Treasurer, Vanadium Corp., 120 Broadway, New York City.

ERRATUM

Page 196. "Electric Art Welding" should read "Electric Arc Welding."

Page 447. "We have three specimens of oil shale and are going to have analysis made of them"; should read "We have three specimens of oil shale, together with the analyses of the strata they represent."

CRAFTSMEN PRINTERS
701 S. La Salle St.
CHICAGO

.22.06
aME Mining Engineering
v.25

REPORT of the PROCEEDINGS

of the

American Mining Congress

Twenty-Fourth Annual Convention

CHICAGO, ILLINOIS
October 17 to 22, 1921

UNIVERSITY OF ILLINOIS LIBRARY

Published by the
AMERICAN MINING CONGRESS
At the Office of the Secretary
Washington, D. C.
1921

UNIVERSITY OF ILLINOIS-URBANA
3 0112 111049216